

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of)	
)	
Allocations and Service Rules for the 71-76 GHz, 81-86 GHz and 92-95 GHz Bands	)	WT Docket No. 02-146
)	
Loea Communications Corporation Petition for Rulemaking)	RM-10288
)	

REPORT AND ORDER

Adopted: October 16, 2003

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By the Commission: Chairman Powell and Commissioners Copps, Martin and Adelstein issuing separate statements.

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I. INTRODUCTION AND EXECUTIVE SUMMARY

1. In this *Report and Order*, we adopt service rules to promote the private sector development and use of the "millimeter wave" spectrum in the 71-76 GHz, 81-86 GHz and 92-95 GHz bands¹ pursuant to Parts 15 and 101 of our Rules. This action follows an initiative by our Office of Engineering and Technology (OET) to spawn possible commercial development of these bands under the Communications Act of 1934, as amended (Act).² By this action, we (1) provide a flexible and streamlined regulatory framework that will encourage innovative uses of the spectrum; (2) accommodate potential future developments in technology and equipment; (3) promote competition in the communications services, equipment and related markets; and (4) advance potential spectrum sharing between non-Federal Government and Federal Government³ systems.⁴ Additionally, we anticipate that the actions we take today will encourage the use of technologies developed by our military and scientific community in a broad range of new products and services, such as high-speed wireless local area networks, and increase access to broadband services, including access systems for the Internet.

2. In the *Report and Order* we make the following major decisions:

- We reallocate the 71-76 GHz, 81-86 GHz and 92-95 GHz bands to update the current allocations, which were established at the World Administration Radio Conference in 1992 (WARC-92, Malaga-Torremolinos) and the World Radiocommunication Conference in 1997 and 2000 (WRC-97, Geneva, and WRC-2000, Istanbul).
- We divide the 71-76 GHz and 81-86 GHz bands into four unpaired 1.25 GHz segments each (eight total), without mandating specific channels within the segment. The segments may be aggregated without limit.
- Non-Federal Government licensees will receive non-exclusive nationwide licenses authorizing operation on all 12.9 GHz of co-primary spectrum. Rights with regard to specific

¹ The term "millimeter wave" is derived from the wavelengths of radio frequency signals between 30 GHz and 300 GHz, which range between 1 and 10 millimeters. The term "bands" generally refers to the combined 71-76, 81-86 and 92-95 GHz bands. If a band is discussed separately, or a discussion pertains to two of the three segments, then the specific segment(s) will be referenced (*e.g.*, 71-76 GHz band, 71-76 GHz and 81-86 GHz bands).

² 47 U.S.C. §§ 301, 303 and 309.

³ In the context of spectrum management, "Federal Government" refers to use by the Federal Government and "non-Federal Government" refers to use by private entities and state and local governments.

⁴ 47 U.S.C. §§ 301, 303 and 309.

links will be established based upon the date and time of link registration. Initially, coordination of non-Federal Government links with Federal Government operations will be accomplished under the existing coordination process, and non-Federal Government links will be recorded in the Commission's Universal Licensing System database. On a permanent basis, such coordination will be accomplished within a new process for coordination of non-Federal Government links with Federal Government users. We envision that coordination will be accomplished via an automated mechanism administered by the National Telecommunications and Information Administration (NTIA), for which the framework will be jointly agreed by the FCC and NTIA. Within four months of the publication of this *Report and Order* in the *Federal Register*, Commission staff, in conjunction with the NTIA, will release a *public notice* setting out the implementation of a new process for coordination of non-Federal Government links with Federal Government users. NTIA has indicated that it believes that it can make the initial version of the mechanism available within 4 months of the *public notice*. In addition, at that time, Commission staff will announce via *public notice* the start-date for the new procedure that we adopt herein for mitigating interference among non-Federal Government links.

- We permit unlicensed non-Federal Government indoor use of the 92-95 GHz band, to be governed by rules based on existing regulations for the 57-64 GHz band.
- We decline to adopt eligibility restrictions for the 71-76 GHz, 81-86 GHz, and 92-95 GHz bands.

II. BACKGROUND

3. The use of wireless frequencies by entities regulated by the Commission is subject to two primary types of regulatory oversight: an allocation of spectrum and rules to govern the operations in the spectrum. Spectrum allocations are set forth in the United States Table of Allocations (U.S. Table) in Section 2.106 of our Rules.⁵ The U.S. Table now extends up to 300 GHz and specifies the types of services for which each band may be used. Service rules describe the specific technical standards and licensing criteria to be used for licensed services; operation of unlicensed devices is governed by technical standards and related provisions.⁶ At present, the highest frequencies for which we authorize licensed services are in the 48.2-50.2 GHz band, and the highest frequencies at which unlicensed devices may operate are in the 76-77 GHz band.⁷ Thus, currently, radio technology that operates above 50.2 GHz may not be licensed except on an experimental basis under Part 5 of our rules,⁸ and devices for operation above 77 GHz on either a licensed or unlicensed basis may not be marketed.⁹

⁵ 47 C.F.R. § 2.106.

⁶ Unlicensed devices that intentionally emit radio frequency energy are regulated under Part 15 of our Rules. 47 C.F.R. Part 15. Part 15 Rules specify limits on the power and operating characteristics of these devices that are designed to avoid the potential for such devices to cause interference. These rules also generally provide that unlicensed devices may not cause interference and must accept interference from other radio transmitters.

⁷ 47 C.F.R. §§ 15.253, 25.202(a)(1). Consistent with their class of licenses, Amateur licensees are permitted to use various bands allocated to the Amateur Service without authorization for specific frequencies.

⁸ 47 C.F.R. § 5.01 *et seq.* These rules permit simplified licensing of spectrum for experiments that would not otherwise be permitted under our Rules. In general, equipment may not be marketed in connection with such experiments, and service may not be provided for commercial use. However, our rules permit "limited market (continued....)

4. In July 2000, the Commission held a public forum on possible new uses of the 92-95 GHz band.¹⁰ Several speakers at the forum indicated that due to recent technological developments, new uses of this band are approaching practicality. In addition, in July 2001 Loea Communications Corporation (Loea) experimented with technology it developed for use of the 71-76 GHz and 81-86 GHz bands.¹¹ As a result, Loea filed a petition requesting the establishment of service rules for the licensed use of the 71-76 GHz and 81-86 GHz bands on September 10, 2001.¹² On June 28, 2002, the Commission proposed rules to allow use of the 71-76 GHz, 81-86 GHz, 92-94 GHz and 94.1-95 (92-95) GHz bands for a broad range of new fixed and mobile services, and sought comment on its proposals.¹³ Those proposals included allocation changes to the bands as well as provisions to ensure that new non-Federal Government operations can share the available frequencies with Federal Government operations in the 71-76 GHz, 81-86 GHz, 92-94 GHz and 94.1-95 GHz bands and protect operations in adjacent bands. Today, we establish the allocation, band plan, service rules, and technical standards for these bands.

III. DISCUSSION

5. The 71-76 GHz, 81-86 GHz and 92-95 GHz bands are essentially undeveloped and available for new uses.¹⁴ Generally, it has been our experience that opening new regions of the spectrum to new applications and technologies fosters the development of new communications products and services for the public and the concomitant economic growth and jobs.¹⁵ Following our experience in other spectrum regions, we believe that opening portions of the millimeter wave spectrum could stimulate new applications of radio technology, facilitate technology transfer from the military, and create new opportunities for economic growth and jobs. This action will also promote United States competitiveness internationally by enabling the development of technology for potential international use.

(Continued from previous page) _____
studies” that permit marketing on a small scale within the context of “limited market studies” in connection with experiments. See 47 C.F.R. § 5.93.

⁹ No licensed service rules address frequency use above 50.2 GHz. The highest frequency specifically authorized for unlicensed use is 77 GHz, which is used for vehicular radar systems, 47 C.F.R. § 15.253.

¹⁰ See Office of Engineering and Technology to Host Forum on 90 GHz Technologies, *Public Notice*, 15 FCC Rcd 18,693 (OET 2000).

¹¹ See Loea Communications Corp. Petition for Rulemaking at 4 (filed Sept. 10, 2001)(Loea Petition).

¹² See *id.*

¹³ Allocations and Service Rules for the 71-76 GHz, 81-86 GHz and 92-95 GHz Bands, *Notice of Proposed Rule Making*, WT Docket No. 02-146, RM-10288, 17 FCC Rcd 12,182 (2002)(*NPRM*).

¹⁴ *Id.* at 12,188 ¶ 10. For additional background information regarding these bands, see *id.* at 12,185-90 ¶¶ 5-13.

¹⁵ See Redevelopment of Spectrum to Encourage Innovation in the Use of New Telecommunications Technologies, *First Report and Order and Third Notice of Proposed Rule Making*, ET Docket No. 92-9, 7 FCC Rcd 6886 (1992) (reallocating portions of the 2 GHz from fixed microwave services to emerging technology systems, including personal communications services (PCS)); Authorization of Spread Spectrum and Other Wideband Emissions not Presently Provided for in the FCC Rules and Regulations, *First Report and Order*, GEN Docket No. 81-413, 101 FCC 2d 419 (1985) (adopting rules in Part 15 for low power spread spectrum devices).

A. Allocation

1. 71-76 GHz

6. *Background.* WRC-2000 allocated the 81-86 GHz band to the Radio Astronomy Service (RAS)¹⁶ on a primary basis. In order to avoid having satellite downlinks in the 81-84 GHz band, which would cause harmful interference to the new primary RAS allocation, the Mobile-Satellite Service (MSS) and Fixed-Satellite Service (FSS) uplink allocations in the 71-74 GHz band were interchanged with the MSS and FSS downlink allocations in the 81-84 GHz band. WRC-2000 also deleted the 72.77-72.91 GHz band from footnotes 5.149 and 5.556¹⁷ and added RAS allocations above 76 GHz.

7. In the *NPRM*, the Commission proposed to implement the *WARC-92 Final Acts* and most of the *WRC-2000 Final Acts* with respect to the 71-76 GHz band.¹⁸ Specifically, the Commission proposed to change the FSS directional indicator in the 71-75.5 GHz band and the MSS directional indicator in the 71-74 GHz band from uplinks to downlinks.¹⁹ As a consequence of the proposal to change the FSS directional indicator in the 74-75.5 GHz band, the Commission proposed to revise footnote US297²⁰ in order to state that 81-82.5 GHz (instead of 74-75.5 GHz) is available for Broadcast-Satellite Service (BSS) feeder links.²¹ The Commission proposed to delete the RAS allocation from the 72.77-72.91 GHz band by removing footnote US270²² from the Table.²³ It also proposed to allocate the 74-76 GHz band to the BSS and broadcasting service on a primary basis and for space research service (SRS) downlinks on a secondary basis.²⁴

¹⁶ The Radio Astronomy Service is astronomy based on the reception of radio waves of cosmic origin. *See* 47 C.F.R. § 2.1.

¹⁷ Footnote 5.556 stated that radio astronomy observations could be carried out under national arrangements in the 72.77-72.91 GHz band and, in making assignments to stations of other services, footnote 5.149 urged administrations to take all practical steps to protect the RAS in this band from harmful interference. *See* 47 C.F.R. § 2.106 nn.5.149, 5.556.

¹⁸ *See NPRM*, 17 FCC Rcd at 12,191 ¶ 20.

¹⁹ *Id.*

²⁰ 47 C.F.R. § 2.106 n.US297.

²¹ *See NPRM*, 17 FCC Rcd at 12,192 ¶ 20. BSS feeder links are uplinks to BSS satellites and are performed in FSS allocations. Feeder links are used to send programming to the satellite for retransmission on BSS downlink frequencies.

²² 47 C.F.R. § 2.106 n.US270.

²³ *See NPRM*, 17 FCC Rcd at 12,191 ¶ 20.

²⁴ The BSS and broadcasting service are regulated solely by the Commission and thus, these allocations will be added only to the non-Federal Government Table.

8. Further, the Commission proposed to allocate the 75.5-76 GHz band to the fixed, mobile, and FSS downlink services on a primary basis and to delete the amateur²⁵ and amateur-satellite service²⁶ allocations from this band.²⁷ The Commission proposed to permit the amateur and amateur-satellite services in the 75.5-76 GHz band to continue on a secondary basis until January 1, 2006, rather than to adopt footnote 5.559A, which would allow these services to operate on a primary basis until 2006.²⁸ In order to implement this proposal, the Commission proposed to add a new frequency sharing requirement to Section 97.303 of our Rules,²⁹ which would read as follows:

No amateur or amateur-satellite station transmitting in the 75.5-76 GHz segment shall cause interference to, nor claim protection from interference due to the operation of, stations in the Fixed Service (FS). After January 1, 2006, the 75.5-76 GHz segment is no longer allocated to the amateur service or to the amateur-satellite service.³⁰

9. In response to a request by the National Telecommunications and Information Administration (NTIA) to protect future Federal Government use, the Commission proposed to adopt the following United States footnote:

USwww In the band 74-76 GHz, stations in the fixed, mobile and broadcasting services shall not cause harmful interference to stations of the Federal Government fixed-satellite service.³¹

The Commission requested comment on the above proposals and whether similar protection should be provided to non-Federal FSS and BSS operations.³² The Commission determined that if both satellite and terrestrial allocations are implemented in the 71-76 GHz band, then technical and regulatory guidelines will be necessary to allow spectrum sharing. Thus, it sought comment on what requirements would be necessary to facilitate sharing between the various services, such as coordination requirements and power flux-density (PFD) limits for satellite operations in the 71-76 GHz band.³³ The Commission also requested comment on whether any coordination requirements adopted to facilitate sharing would

²⁵ The Amateur service is a generally a radiocommunication service carried out by authorized individuals for personal aim without pecuniary interest. 47 C.F.R. § 97.1(a)(4).

²⁶ The Amateur-satellite service is a radiocommunication service using stations on Earth satellites for the same purpose as those of the amateur service. 47 C.F.R. § 97.1(a)(3). *See supra*, n. 25.

²⁷ *See NPRM*, 17 FCC Rcd at 12,191 ¶ 20. The amateur and amateur-satellite services allocations are regulated solely by the Commission. Our proposed allocation changes are to be made only to the non-Federal Government Table.

²⁸ *Id.* at 12,192 ¶ 23.

²⁹ 47 C.F.R. § 97.303.

³⁰ *NPRM*, 17 FCC Rcd at 12,192 ¶ 24.

³¹ *Id.*

³² *Id.* at 12,191 ¶ 22.

³³ *Id.*

eliminate the need for the footnote to protect future FSS use, thus placing all allocations on equal footing.³⁴

10. *Discussion.* Commenters generally supported the Commission's proposals to implement the WARC-92 and WRC-2000 *Final Acts*.³⁵ While Canada and other administrations have implemented the secondary SRS downlink allocation in the 74-76 GHz band from WARC-92,³⁶ international implementation of the WRC-2000 *Final Acts* appears to be just commencing.³⁷ We agree that these changes are appropriate and will simplify coordination among satellite, terrestrial, and broadcast services. Consequently, we adopt the proposed changes to the U.S. Table. Accordingly, the 71-76 GHz band is allocated to the fixed, fixed-satellite (space-to-Earth), and mobile services on a primary basis; the 71-74 GHz band is additionally allocated to the mobile-satellite (space-to-Earth) on a primary basis; and the 74-76 GHz band is additionally allocated to the broadcasting and broadcasting-satellite services on a primary basis and to the space research service (space-to-Earth) on a secondary basis. All of these allocations will be available for both Federal and non-Federal Government use, except for the broadcasting and broadcasting-satellite service allocations, which are limited to non-Federal Government use.

11. In the matter of amateur radio sharing of the 71-76 GHz band, the Wireless Communications Association International, Inc. (WCAI) and The Boeing Company (Boeing) agree that the amateur and amateur-satellite operations in the 75.5-76 GHz band should be permitted only on a secondary basis.³⁸ The *NPRM* states that it is unclear whether the 75.5-76 GHz amateur radio band is being used. Amateurs state that there is documentary evidence of recent use of 75 GHz and higher frequencies by amateur radio operators.³⁹ However, as Boeing notes, amateur radio operators have access to the adjacent 77 GHz band.⁴⁰ Therefore, we conclude that moving these operations out of the 75.5-76 GHz band would not pose a major inconvenience to amateur radio, but would substantially benefit future fixed services, because it would eliminate the possibility of harmful interference from amateurs. Accordingly, the primary allocations to the amateur and amateur-satellite services in the 75.5-76 GHz band are downgraded from primary to secondary status. Secondary use will cease on January 1, 2006. We codify this transition plan in footnote US387 and in Section 97.303(r)(3) of our amateur service rules.

³⁴ *Id.*

³⁵ The Wireless Communications Association International, Inc. (WCAI) Comments at 2, 5, 25; Loea Comments at 32; The Boeing Company (Boeing) Comments at 2; NTIA's "For IRAC Review on Feb 26, 2002", at 1.

³⁶ See, e.g., *Canadian Table of Frequency Allocations 9 kHz to 275 GHz* (Industry Canada, December 2000). WARC-92 allocated the 74-84 GHz band to the space research service (space-to-Earth) on a secondary basis.

³⁷ The European Common Table has been updated to reflect the Above 71 GHz realignment in the *WRC-2000 Final Acts*. "Although the implementation of this Table has been arranged for the year 2008 it is expected that the European Conference of Postal and Telecommunications Administrations (CEPT) member countries will endeavor to implement, as soon as possible, as many parts of the Table as they are able." *The European Table of Frequency Allocations and Utilizations Covering the Frequency Range 9 kHz To 275 GHz* at 3 (European Radiocommunications Committee (ERC), eds., 2002, rev. 2003). In April 2002, Canada proposed to update its Table to reflect the Above 71 GHz realignment, but it has not been finalized. *Proposed Revisions to the Canadian Table of Frequency Allocations*, (Industry Canada, eds., 2002).

³⁸ WCAI Comments at 5; Boeing Comments at 2.

³⁹ Leggett Comments, Set 2 at 1-2, and Appendix A.

⁴⁰ Boeing Comments at 2.

12. The Commission requested comments regarding sharing of the 71-76 GHz band, and protection to non-Federal Government FSS and BSS operations. Boeing indicated that it is premature to adopt satellite downlink PFD limits in the upper millimeter-wave frequencies above 70 GHz, to facilitate sharing of the 71-76 GHz band,⁴¹ and suggested the domestic adoption of a modified footnote USwww to be applicable to the entire 71-76 GHz frequency band to protect both Federal Government and non-Federal Government satellite receive earth stations from earlier deployment of fixed stations in this upper millimeter-wave spectrum. On the basis of ongoing discussions with NTIA and the Commission, we have modified and re-numbered proposed footnote USwww as to read as follows:

US389 In the bands 71-76 GHz and 81-86 GHz, stations in the fixed, mobile, and broadcasting services shall not cause harmful interference to, nor claim protection from, Federal Government stations in the fixed-satellite service at any of the following 28 military installations:

Military Installation	State	Nearby city
Redstone Arsenal.....	AL	Huntsville
Fort Huachuca.....	AZ	Sierra Vista
Yuma Proving Ground.....	AZ	Yuma
Beale AFB.....	CA	Marysville
Camp Parks Reserve Forces Training Area.....	CA	Dublin
China Lake Naval Air Weapons Station.....	CA	Ridgecrest
Edwards AFB.....	CA	Rosamond
Fort Irwin.....	CA	Barstow
Marine Corps Air Ground Combat Center.....	CA	Twentynine Palms
Buckley AFB.....	CO	Aurora (Denver)
Schriever AFB.....	CO	Colorado Springs
Fort Gordon.....	GA	Augusta
Naval Satellite Operations Center.....	GU	Finegayan
Naval Computer and Telecommunications Area Master Station, Pacific.....	HI	(Territory of Guam)
Fort Detrick.....	MD	Wahiawa (Oahu Is.)
Nellis AFB.....	NV	Frederick
Nevada Test Site.....	NV	Las Vegas
Tonapah Test Range Airfield.....	NV	Amargosa Valley
Cannon AFB.....	NM	Tonapah
White Sands Missile Range.....	NM	Clovis
Dyess AFB.....	TX	White Sands Abilene
Fort Bliss.....	TX	El Paso
Fort Sam Houston.....	TX	San Antonio
Goodfellow AFB.....	TX	San Angelo
Kelly AFB.....	UT	San Antonio
Utah Test and Training Range.....	VA	.....
Fort Belvoir.....	VA	Alexandria Chesapeake
Naval Satellite Operations Center.....		

⁴¹ *Id.* at 4.

We believe that the originally proposed footnote was broader than necessary to protect critical Federal Government operations; however, we believe that a narrower footnote as proposed by NTIA will sufficiently protect Federal Government operations and maximize non-Federal Government use. Federal Government fixed-satellite service systems may operate at locations other than those identified above. Coordination between Federal Government fixed-satellite service systems and non-Federal Government space and terrestrial systems operating in accordance with the United States Table of Allocations is required at all locations.

13. Cisco Systems, Inc. (Cisco) does not oppose the Commission's footnote USwww as proposed in the *NPRM* because it assumes that Federal Government FSS operations would involve a relatively small number of earth stations at relatively remote locations (rather than major metropolitan areas).⁴² On the other hand, because there are no assurances that these assumptions are correct, it cannot affirmatively support that proposed footnote at this time. Before a footnote is adopted, Cisco believes that current or potential Federal Government users should give the Commission information regarding the scope and location of FSS operations in the 74-76 GHz band. Based on this information, Cisco would like the Commission to formulate limitations on the footnote that will give fixed, mobile and broadcasting users the confidence to make rational investments in a radio link. Cisco supports making FSS and BSS allocations,⁴³ but opposes, jointly with Loea,⁴⁴ Boeing's version of a new footnote USwww to the table of allocations.⁴⁵ Except as noted in the preceding paragraph regarding Federal Government fixed satellite services, we conclude that the technology and use of the 71-76 GHz band need to mature to allow us to arrive at the correct parameters for sharing of the band, so it would be premature to adopt any version of footnote USwww with respect to the non-Federal Government fixed satellite service.

14. With regard to mobile use, Cisco and the Fixed Wireless Communications Coalition (FWCC) assert that mobile use of the 71-76 GHz band is incompatible with fixed service.⁴⁶ These commenters believe that the allocation for mobile use should be postponed until the Commission develops a record concerning predictions about interference.⁴⁷ We concur that there is currently not enough data to arrive at interference predictions in the 71-76 GHz band. However, we believe that the appropriate course of action is to not change the allocation now, but defer adoption of rules for operation of terrestrial mobile services until inter-service interference issues are resolved. We believe this will foster innovation and will give licensees the opportunity to make use of technological advances in order to develop ways to use this band for mobile operations. Furthermore, we note that this action is consistent with that taken regarding mobile services in the 39 GHz band.⁴⁸ Thus, the approach we take here with respect to the mobile allocation is not unprecedented.

⁴² Cisco Systems, Inc. (Cisco) Comments at 8.

⁴³ Cisco Reply at 4.

⁴⁴ Loea Reply at 4-7

⁴⁵ Cisco Reply at 4-5.

⁴⁶ See, e.g., Cisco Reply at 3; FWCC Comments at 6.

⁴⁷ Cisco Reply at 3.

⁴⁸ See Amendment of the Commission's Rules Regarding the 37.0-38.6 GHz and 38.6-40.0 GHz Bands, *Report and Order and Second Notice of Proposed Rule Making*, 12 FCC Rcd 18,600, 18,617-19 ¶¶ 30-33 (39 GHz R&O) (1997).

2. 81-86 GHz

15. *Background.* In the *NPRM*, the Commission proposed to implement the *WARC-92 Final Acts* and most of the *WRC-2000 Final Acts* with respect to the 81-86 GHz band.⁴⁹ Specifically, the Commission proposed to allocate the 81-86 GHz band to the RAS on a primary basis, to change the directional indicators on the FSS and MSS allocations in the 81-84 GHz band from downlinks to uplinks, to allocate the 84-86 GHz band for FSS uplinks, and to delete the BSS and broadcasting allocations from the 84-86 GHz band.⁵⁰ The Commission proposed to revise footnote US297 to state that 81-82.5 GHz (instead of 74-75.5 GHz) is available for BSS feeder links. It also proposed to revise footnote US211 by deleting the 84-86 GHz band from those bands in which applicants for airborne or space station assignments are urged to take all practicable steps to protect RAS observations in adjacent bands from harmful interference,⁵¹ and to revise footnote US342 in order to add the 81-86 GHz band to the list of frequency bands wherein all practicable steps are to be taken to protect the RAS from harmful interference when assignments to stations in other services are made.⁵²

16. The Commission requested comment on whether footnote 5.561A, which would allocate the 81-81.5 GHz band to the amateur and amateur-satellite services on a secondary basis, should be adopted domestically.⁵³ The Commission has previously allocated the 77.5-78 GHz band to the amateur and amateur-satellite services on a primary basis. It therefore sought comment on whether these secondary allocations are needed. Further, it requested comment on whether amateur and amateur-satellite services in the 81-81.5 GHz band would be compatible with primary commercial operations.⁵⁴

17. *Discussion.* As discussed previously, commenters generally supported the Commission's proposals to implement the *WARC-92* and *WRC-2000 Final Acts*.⁵⁵ We believe that these changes are appropriate, and will eliminate prospective interference to satellite operations. Consequently, we adopt the proposed changes to the U.S. Table. Accordingly, the 81-86 GHz band is allocated to the fixed, fixed-satellite (Earth-to-space), mobile, and radio astronomy services on a primary basis; and the band 81-84 GHz is additionally allocated to the mobile-satellite service (Earth-to-space) on a primary basis and to the space research service (space-to-Earth) on a secondary basis. All of these allocations will be available for both Federal and non-Federal Government use.

18. With respect to amateur and amateur-satellite service operations at 81-81.5 GHz, commenters oppose a secondary allocation.⁵⁶ As noted above, we conclude that the primary allocation at 77.5-78 GHz already provides sufficient spectrum for amateur and amateur-satellite services in this frequency range.

⁴⁹ *NPRM*, 17 FCC Rcd at 12,194 ¶ 30.

⁵⁰ *Id.* The Commission also proposed to delete the requirement in footnote 5.561 that fixed, mobile, and broadcasting in the 84-86 GHz band not cause harmful interference to BSS. *Id.* at 12,195 ¶ 34.

⁵¹ *Id.* at 12,194 ¶ 30.

⁵² *Id.* at 12,194 ¶ 31.

⁵³ *Id.* at 12,194 ¶ 32.

⁵⁴ *Id.*

⁵⁵ *See supra* ¶ 10.

⁵⁶ FWCC Comments at 5-6; Sprint Comments at 4; WCAI Comments at 8.

Moreover, allowing amateur operations to share with commercial operations could complicate frequency coordination because this band will be used by commercial operations, which require reliability, to pair with the 71-76 GHz band if such use is needed.

19. Commenters' replies to the Commission's request for comments regarding sharing of the 81-86 GHz band were the same or similar to those discussed *supra* for the 71-76 GHz band allocation,⁵⁷ and we are also persuaded that it is too early to draw reliable conclusions about frequency sharing in this band.⁵⁸ Historically technology needs to mature to produce actual data on actual interference conditions. These frequencies pose less of an interference problem potential than lower microwave frequencies, due to the high attenuation to which they are subject, and their particular characteristics. Also, we do not know which typical levels of EIRP will be actually used by the industry. Adopting premature parameters could have a negative impact by slowing down the development of the band and manufacture of equipment. Therefore, we arrive at the same conclusions for the 81-86 GHz band as we did concerning the 71-76 GHz band, and will maintain multiple services in the allocation table for the 71-76 GHz band, but will address possible sharing criteria in the future. We also delay any action regarding the BSS and broadcasting allocations for the 84-86 GHz band because, as of yet, we do not have reliable evidence that demonstrates whether the provision of such services is suitable for this band.

3. 92-95 GHz

20. *Background.* WRC-97 allocated the 94-94.1 GHz band to the Earth exploration-satellite service (EESS) and SRS for active sensor operations,⁵⁹ and limited the use of these allocations to spaceborne cloud radars.⁶⁰ The fixed, mobile, and FSS uplink allocations were deleted from the 94-94.1 GHz band. At WRC-2000, the 94-94.1 GHz band was allocated to the RAS on a secondary basis, and the 92-94 GHz and 94.1-95 GHz bands were allocated to the RAS on a primary basis.⁶¹ The FSS uplink allocations in the 92-94 GHz and 94.1-95 GHz bands were deleted.

21. In the *NPRM*, the Commission proposed to implement the *WRC-97 Final Acts* and *WRC-2000 Final Acts* with respect to the 92-95 GHz band.⁶² Specifically, it proposed to allocate the 92-94 GHz and 94.1-95 GHz bands to the RAS on a primary basis. The Commission also proposed to allocate the 94-94.1 GHz band to the EECS (active) and SRS (active) on a primary basis for Federal Government use, limited to cloud radars, to allocate the 94-94.1 GHz band to the RAS on a secondary basis, and to delete the fixed and mobile allocations from that band.⁶³ In addition, it proposed to delete the FSS uplink allocation from the 92-95 GHz band.⁶⁴ Consistent with international footnote 5.149, the Commission

⁵⁷ Cisco Comments at 12-13; Loea Reply at 5-6.

⁵⁸ Cisco Comments at 16; NTIA Reply at 7; Terabeam Reply at 10-11.

⁵⁹ An active sensor is an EECS or SRS measuring instrument by means of which information is obtained by transmission and reception of radio waves. See 47 C.F.R. § 2.1.

⁶⁰ *NPRM*, 17 FCC Rcd at 12,189 ¶ 12, 12,196 ¶ 37.

⁶¹ *Id.* at 12,196 ¶ 38.

⁶² *Id.* at 12,196 ¶ 40.

⁶³ *Id.*

⁶⁴ *Id.*

proposed to revise footnote US342 to add the 92-94 GHz and 94.1-95 GHz bands to the list of frequency bands wherein all practicable steps are to be taken to protect the RAS from harmful interference when assignments to stations of other services are made.⁶⁵

22. *Discussion.* Commenters support the Commission's proposals.⁶⁶ NTIA supports full sharing of the band and finds that it is unnecessary to partition the band; it also supports the proposed revisions to the National Table of Frequency Allocations summarized in the *NPRM*.⁶⁷ NTIA indicates that NASA currently has in place a prototype cloud-profiling radar operation.⁶⁸ Accordingly, NTIA supports the allocation of the 94-94.1 GHz band to the space research service. We agree that these changes are appropriate, and will avoid interference to important scientific research. Consequently, we adopt the proposed changes to the U.S. Table. Accordingly, the 92-94 GHz and 94.1-95 GHz bands are allocated to the fixed, mobile, radio astronomy, and radiolocation services on a primary basis. The 94-94.1 GHz band is allocated to the Earth exploration-satellite (active), space research (active), and radiolocation services on a primary basis and to the radio astronomy service on a secondary basis. All of these allocations are available for Federal and non-Federal Government use, except for the EESS (active) and SRS (active) allocations, which are limited to Federal Government spaceborne cloud radar use.

4. RAS Protection in the 81-86 GHz, 92-94 GHz, and 94.1-95 GHz Bands

23. *Background.* In the *NPRM*, the Commission noted that it had proposed to allocate the 81-86 GHz, 92-94 GHz, and 94.1-95 GHz bands to the RAS on a primary basis, but in order to implement the WRC-2000 allocations, it also sought comment on whether, given the primary RAS allocation in the 86-92 GHz band, the entire proposed RAS allocation was necessary. The Commission also sought comment on how to avoid interference to the eighteen receive only RAS observatories that currently receive in the 81-86 GHz, 92-94 GHz, and 94.1-95 GHz bands.⁶⁹

24. The customary means of protecting RAS reception is through coordination around RAS observatories. The Commission tentatively proposed to adopt a proposal by the National Science Foundation (NSF) to require coordination by all other allocated sources within coordination radii of the order of 150 kilometers around the eight single dish observatories, and 25 kilometers around the ten Very Long Baseline Array (VLBA) stations.⁷⁰ The Commission also requested comment on how to minimize any coordination burden on relevant parties.⁷¹ In particular, it sought comment on whether to require RAS observatories to operate a web site where fixed point-to-point licensees can input end points of links, power, and antenna characteristics and promptly receive a determination whether coordination is required. The web site would take into account the observatory sensitivity, terrain shielding, and the azimuth of the

⁶⁵ *Id.* at 12,196-97 ¶ 41.

⁶⁶ *See, e.g.,* Sprint Comments at 4-5; WCAI Comments at 9.

⁶⁷ NTIA Reply at 2-3.

⁶⁸ *Id.* at 9.

⁶⁹ *NPRM*, 17 FCC Red at 12,197-98 ¶ 44.

⁷⁰ *See id.* at 12,198 ¶ 45; *see id.* at 12,244 for the list of RAS telescopes that would be protected under this proposal.

⁷¹ *See id.* at 12,198 ¶ 45.

path relative to the observatory.⁷² In the alternative, the Commission sought comment on whether to geographically limit the scope of these RAS allocations in a similar fashion to the RAS allocation in the 10.6-10.68 GHz band, which provides that the RAS will not receive protection from stations in other allocated services that are licensed to operate in the one hundred most populous urbanized areas as defined by the U.S. Census Bureau.⁷³

25. *Discussion.* In general, commenters such as The National Radio Astronomy Observatory (NRAO), FWCC, the National Academy of Sciences, through the National Research Council's Committee on Radio Frequencies (NAS), and WCAI supported the allocations made at WRC-2000 for these bands and retaining primary status for RAS.⁷⁴ As the Commission recognized in the *NPRM*, radio astronomers must observe radio waves of cosmic origin at frequencies over which they have no control.⁷⁵ We understand that due to the extremely low levels of the signals to be observed, sharing a frequency band with other services which operate at thousands of times higher levels poses a unique challenge. We agree that adequate protection methods must exist for the RAS to operate, and, consequently, we allocate the 81-86 GHz and the 92-95 GHz (except 94-94.1 GHz) segments of the band for RAS operations on a co-primary basis.

26. With respect to coordination procedures, some commenters, such as NTIA, Cisco, Terabeam and Loea support the customary coordination around RAS observatories and the adoption of the NSF approach.⁷⁶ NAS and NRAO also support it, but advocate using a 60 kilometer radius around the VLBA stations. They indicated that this would be consistent with the value for the same set of RAS sites in the table in Section 101.31 of the Commission's Rules.⁷⁷ However, we are aware that NSF is developing revised interference protection criteria between RAS and the other services in the 81-86 GHz and 92-95 GHz segments of the band that are anticipated to take into account the observatory sensitivity, terrain shielding, and the azimuth of the path relative to the observatory.⁷⁸ We understand that the NTIA intends

⁷² *Id.* This approach is similar to the coordination method that was developed for the 1670-1675 MHz Government transfer band, whereby the National Oceanic and Atmospheric Administration maintains a web site (<http://www.osd.noaa.gov/radio/frequency.htm>) to assist in coordination near two of its receive earth stations. See 47 C.F.R. § 1.924(f)(1).

⁷³ *NPRM*, 17 FCC Rcd at 12,199 ¶ 46 (citing 47 C.F.R. § 2.106 n.US277).

⁷⁴ NRAO Comments at 1; FWCC Comments at 4; NAS Comments at 4; WCAI Comments at 9 and 10 (with the caveat that RAS be secondary in the 94-94.1 GHz segment).

⁷⁵ *NPRM*, 17 FCC Rcd at 12,198 ¶ 44. The radio frequencies of interest for the RAS depend on the characteristics of the object studied. Celestial radio sources radiate radio waves varying with time and frequency, with intensity and polarization determined by their physical conditions. Each part of the radio spectrum gives specific information about a source. Radio astronomers have to follow the constraints on frequency selection imposed by nature. A similar situation holds for atmospheric studies based on observations of atmospheric gases. These gases generate radio emissions at one or more discrete frequencies called a spectral line. These spectral lines are often of interest for radio astronomers. In addition, various RAS projects depend on measurements of broadband or continuum emission. See International Telecommunication Union Handbook on Radio Astronomy 5-9 (Working Party 7D of ITU-R Study Group 7, eds., 1995).

⁷⁶ NTIA Reply at 10; Cisco Reply at 12; Terabeam Reply at 3; Loea Reply at 24-25.

⁷⁷ 47 C.F.R. § 101.31; NAS Comments at 7; NRAO Comments at 2.

⁷⁸ Loea Reply at 24; NTIA Reply at 11-14.

to include non-Federal Government Radio Astronomy sites in its planned automated mechanism for coordination purposes (discussed *infra*). To this end, we delegate authority to the Wireless Telecommunications Bureau and the Office of Engineering and Technology to interface with NSF and NTIA and to take whatever action is necessary to implement appropriate RAS interference protection, as well as coordination procedures regarding other users,⁷⁹ if, contrary to expectations, NSF and NTIA fail to finalize revised interference criteria and to include non-Federal Government radio astronomy sites in its planned automated mechanism.

B. Band Plan

1. 71-76 GHz and 81-86 GHz Bands

27. Background. The 71-76 GHz and 81-86 GHz bands are allocated on a co-primary basis for Federal Government services.⁸⁰ In the *NPRM*, the Commission considered protection for co-primary services in the event Federal Government or satellite operators seek to use these bands in the future.⁸¹ In addition, it found that the bands adjacent to the 71-76 GHz and 81-86 GHz bands, especially the 86-92 GHz passive band, may require protection.⁸²

28. The Commission sought comment on Loea's proposal to authorize the entire 71-76 GHz and 81-86 GHz bands for fixed use.⁸³ The Commission specifically sought comment on whether Loea's band plan proposal for the 71-76 GHz and 81-86 GHz bands provides adequate protection for the Federal Government and non-Federal Government services that share the bands on a co-primary basis.⁸⁴ It also sought comment on the extent to which it should implement sharing criteria between fixed services and other services authorized for the bands.⁸⁵ Further, the Commission sought comment on whether Loea's proposed band plan for the 71-76 GHz and 81-86 GHz bands provides adequate protection for the adjacent bands, especially the passive 86-92 GHz band.⁸⁶ Lastly, the Commission also invited commenters to propose alternative band plans for this spectrum that would provide flexibility and efficient spectrum usage while providing adequate protection for the co-primary users described above.⁸⁷ It asked them to consider the bands adjacent to the 71-76 GHz and 81-86 GHz bands.⁸⁸

⁷⁹ See License Coordination, *infra* at ¶¶ 47-57. Regarding the coordination procedure, we understand that NTIA is willing to consider including non-Federal Government RAS sites on its planned database for coordination purposes (discussed *infra*).

⁸⁰ 47 C.F.R. § 2.106.

⁸¹ *NPRM*, 17 FCC Rcd at 12,203 ¶ 57.

⁸² *Id.*

⁸³ See Loea Petition at 10.

⁸⁴ *NPRM*, 17 FCC Rcd at 12,205 ¶ 60.

⁸⁵ *Id.*

⁸⁶ *Id.*

⁸⁷ *Id.* at 12,205 ¶ 61.

⁸⁸ *Id.*

29. *Discussion.* The majority of commenters support Loea's band plan, which consists in assigning the totality of the available spectrum in the 71-76 GHz and 81-86 GHz to each licensee.⁸⁹ The Joint Parties propose that the 71-76 and 81-86 GHz bands should be designated as paired channels, such that transceivers operating in these bands will transmit in one channel only and receive in the other.⁹⁰ Harris disagrees with the proposal to require pairing of the 71-76 GHz band with the 81-86 GHz band, and recommends instead that the bands be licensed optionally separately or together.⁹¹

30. Commenters generally believe that non-Federal Government use of the 71-76 GHz and 81-86 GHz bands will likely be for point-to-point, common carrier quality, last mile and first mile connections (instead of copper or fiber pairs).⁹² Personal Broadband Wireless Access Networks connected to small and large enterprises in underserved and unserved markets,⁹³ consumer-priced WiFi devices for homes or more sophisticated equipment for universities and corporations, Wireless Local Area Networks,⁹⁴ and unlicensed wireless devices⁹⁵ were other possible uses for the spectrum mentioned by commenters to the *NPRM*.

31. Based on the record in this proceeding, we are not persuaded that in every instance licensees will require five gigahertz of bandwidth in each direction to provide the services described above. Commenters such as Loea view the 71-76 GHz, 81-86 GHz and 92-95 GHz (70-80-90 GHz) spectrum as a possible substitute for fiber optic communications in those places where it is unpractical to dig to lay fiber optic cable, rather than as a substitute for the traditional uses such as telephony, DS-1 and TV relay.⁹⁶ Because this is the case, we note that, assuming the spectrum is used at a one bit per Hertz efficiency rate, one OC-3 signal would occupy only 3.12% of a five gigahertz segment; and can accommodate 1,920 voice channels or data of up to 155.52 Megabits per second (Mbps). Furthermore, one OC-48 signal, which equals three OC-3 signals, would occupy less than half (49.76%) of five gigahertz, and would be capable of carrying data of up to 2.488 Gigabits per second (Gbps). Moreover, the importance of allowing competition, when providing this type of broadband-high speed services to customers, especially in heavily populated areas, warrants segmentation. We therefore conclude that we should adopt a frequency utilization plan based on units smaller than 5 GHz, as explained below. Such a plan will encourage efficiency because users will not have excess bandwidth, maximize spectrum re-use because more than one provider may be able to use the same land microwave path, and facilitate

⁸⁹ See, e.g., Sprint Comments at 5; WCAI Comments at 11; Cisco Reply at 13; Joint Parties Reply at 2; Loea Reply at 19; FWCC Comments at 9; Harris Comments at 5; Terabeam Reply at 6-9.

⁹⁰ Joint Parties Reply at 4.

⁹¹ Harris Reply at 3.

⁹² Loea Reply at 1; Endwave Comments at 2 & 5; Harris Comments at 1.

⁹³ I-Fi, LLC/BGI Comments at 1; K.C.C. Inc. Comments at 1.

⁹⁴ Cisco Comments at 6.

⁹⁵ Wi-Fi Alliance Comments at 2.

⁹⁶ See, e.g., Loea Comments at 3, 5.

coordination among users because smaller bandwidth with the same power density has less potential of generating harmful interference than broader bandwidth.⁹⁷

32. Specifically, we will segment the 71-76 GHz and 81-86 GHz bands. We believe that licensing the spectrum in building blocks of 1.25 GHz increments provides ample capacity by today's standards and the flexibility for technological development because it makes it possible to justify the use of up to the full 10 GHz by combining these blocks. We note that virtual fiber⁹⁸ today is reported to be carrying data in the range of 1.25 Gbps, and expected to approach 2.5 Gbps in the near future.⁹⁹ The proposed band segmentation easily accommodates these building blocks, and allows them to be combined to occupy up to 10 GHz of spectrum. In order to maximize the number of possible users at a given location, we will divide the 71-76 GHz and 81-86 GHz bands into unpaired 1.25 GHz segments (without mandating specific channels within the segment) with no aggregation limit. We will permit pairing, but only in a standardized manner (*e.g.*, 71-72.25 GHz may be paired only with 81-82.25 GHz, and so on). This band segmentation provides the flexibility for licensees to choose how much spectrum to use, thus promoting competition by making it possible for more than one provider to use different segments of the band, should more than one provider need to use the same microwave path to reach the same segment of the population.

2. 92-95 GHz Band

33. *Background.* In the *NPRM*, the Commission requested comment on three band plans for the 92-95 GHz band.¹⁰⁰ Under Band Plan I, the Commission would license the 92.3-93.2 GHz and 94.1-95 GHz spectrum blocks for commercial use.¹⁰¹ Primary Federal Government assignments would be made in the 92-92.3 GHz and 93.2-94.1 GHz spectrum blocks throughout the nation. In addition, primary Federal Government assignments could be authorized in the licensed non-Federal Government bands at designated military installations. Outside the designated military installations, the Commission proposed that Federal Government assignments would be authorized in the licensed non-Federal Government bands on a secondary basis. Band Plan I would also make the 92-95 GHz band available for unlicensed Part 15 use on a secondary basis in the primary Federal Government bands (92-92.3 GHz and 93.2-94.1 GHz). Band Plan II shares many of the characteristics of Band Plan I as it also divides the primary Federal

⁹⁷ *Cf.* The 4.9 GHz Band Transferred from Federal Government Use, *Memorandum Opinion and Order and Third Report and Order*, WT Docket No. 00-32, 18 FCC Rcd at 9152, 9156-57 ¶¶ 38-40 (2003) (*4.9 GHz Third R&O*).

⁹⁸ "Virtual fiber" is a term used by some in the communications industry to describe bandwidth segments in the microwave bands capable of carrying the same amount of data as fiber optic cable. The capacity and loading requirements specified in our rules in Section 101.141 (a) (3) show that in such microwave bands as the 6 GHz or 11 GHz, the bandwidth segments of 0.4 to 40 MHz have a typical utilization of 1.54 to 134.1 Mbits/sec or the equivalent of 1 DS-1 to 3 DS-3 lines. In fiber optics, and in these higher 70/80/90 GHz microwave bands, greater bandwidth segments than 40 MHz are afforded (5,000 MHz is possible here), and the typical utilization is one or more OC-3 signals (155.52 Mbits/sec per OC-3 signal). Because of the similarity in data carrying capacity between fiber optics and the 70/80/90 spectrum the term "Virtual fiber" was coined.

⁹⁹ Letter dated Mar. 19, 2003 from Thomas Cohen, The KDW Group, to Marlene H. Dortch, Secretary, Federal Communications Commission, at 9 (Slide #7 of March 19, 2003 Presentation to the FCC by Louis Slaughter, CEO Loea Comm. Corp.).

¹⁰⁰ *NPRM*, 17 FCC Rcd at 12,199-205 ¶¶ 47-61.

¹⁰¹ *Id.* at 12,200 ¶ 50.

Government spectrum from the primary non-Federal Government spectrum, but the segmentation of the band is different.¹⁰² Another option, Band Plan III, proposed by Boeing, provides licensees in the 92-95 GHz band with access to 2,900 megahertz of spectrum (92-94 GHz and 94.1-95 GHz), which is all of the 92-95 GHz band that can be allocated to the fixed and mobile services.¹⁰³ Federal and non-Federal licensees would share the spectrum on a co-primary basis.

34. *Discussion.* NTIA welcomes shared use of the band by commercial entities, but with no restriction to the essential Federal Government radiolocation service use of the band.¹⁰⁴ While the Federal Government desires to share the band to the maximum degree possible, NTIA explains that Federal Government systems cannot operate on a secondary basis or be restricted to operate only on Federal Government property.¹⁰⁵ For example, according to the NTIA, current and planned Federal Government systems operating in the 92-95 GHz have bandwidths that exceed the Federal Government primary segments proposed in Band Plans I and II, and Federal Government radiolocation operations will occupy these segments of the band. NTIA indicates that Federal Government use of the band will be for both military and federal civil agency applications.¹⁰⁶ Because the extent and location of future Federal Government operations in this band cannot be precisely defined at this time, the NTIA believes that coordination must be required for successful sharing.¹⁰⁷

35. Other commenters generally discussed the band plan for 92-95 GHz. Joint Parties,¹⁰⁸ for example, did not specifically propose a band plan, but generally advised that only minimal segmentation of the 92-95 GHz band should be made, where necessary to protect the 94.0-94.1 GHz cloud radar band.¹⁰⁹ In addition, Boeing stated that the Commission should adopt a band plan to allow diverse technologies to reuse the same scarce spectrum.¹¹⁰ Also, Sprint believes that Band Plan III will support the widest range of new uses.¹¹¹

¹⁰² *Id.* at 12,202 ¶ 55. Both Plan I and Plan II assign the same amount of spectrum on a primary basis to Federal Government (1.2 GHz) and non-Federal (1.8 GHz), but in different parts of the spectrum. In Plan II, the primary assignments for the Federal Government would be the 92.0-92.6 GHz and 93.5-94.1 GHz bands.

¹⁰³ *Id.* at 12,202-03 ¶ 56.

¹⁰⁴ NTIA Reply at 15.

¹⁰⁵ *Id.*

¹⁰⁶ *Id.*

¹⁰⁷ *Id.*

¹⁰⁸ Joint Parties Reply comprises the reply comments of Loea, Cisco, Endwave Corporation, Ceragon Networks, BridgeWave Communications, Inc., and Stratex Networks (Joint Parties).

¹⁰⁹ *Id.* at 2.

¹¹⁰ Boeing Comments at 3.

¹¹¹ Sprint Comments at 5.

36. The record before us also shows that there is considerable interest in using the 92-95 GHz band for unlicensed, Part 15 devices.¹¹² For example, the FWCC points out that unlicensed devices are ideal for a wide range of applications which require low cost or rapid installation and successfully underlay other applications in the same spectrum.¹¹³

37. We conclude that Band Plan III best accommodates the concerns of NTIA and the non-Federal Government commenters. Under that plan, Federal Government users will have access to the entire band nationwide on a co-primary basis. Non-Federal Government licensees also will have access to the maximum possible part of the band, also on a co-primary basis. In addition, Band Plan III provides the greatest opportunity for unlicensed use. Consequently, we adopt this plan. Non-Federal Government licensees will be permitted to use either or both of the two co-primary segments (92.0-94.0 GHz and 94.1-95.0 GHz) for point-to-point services under Part 101. In addition, we will allow unlicensed Part 15 devices in the co-primary segments.¹¹⁴ We also find that the services in this band will be technically compatible with the operation of Federal radiolocation services. If any interference issues unexpectedly develop, we will work with the NTIA to find jointly acceptable solutions. Rules for unlicensed devices, and coordination procedures between non-Federal Government licensees and Federal Government users, are addressed later in this *Report and Order*.

C. Rules for Unlicensed Devices

38. *Background.* In the *NPRM*,¹¹⁵ the Commission proposed to make the 92-95 GHz band available for unlicensed use and set forth proposed rules¹¹⁶ that are based on existing regulations for the 57-64 GHz band.¹¹⁷ It determined that power levels for 57-64 GHz unlicensed operation are also appropriate for 92-95 GHz because they were based primarily on safety issues with respect to power densities.¹¹⁸ The Commission set forth proposed rules that were structured to be as flexible as possible with no restrictions on the types of modulation or applications, except that these devices may not be used

¹¹² FWCC Comments at 7; Wi-Fi Comments at 3; WCAI Comments at 12; NTIA Reply at 10 (NTIA explains that NSF states that Part 15 devices pose no sharing problems for U.S. radio astronomy facilities under any of the band plans listed in the *NPRM*, so long as these devices are limited to indoor use and preclude airborne applications); Comsearch Reply at 2; NAS Comments at 9.

¹¹³ FWCC Comments at 7.

¹¹⁴ Part 15 devices are prohibited from causing harmful interference to, and must accept interference from, other operations. See 47 C.F.R. § 15.5(b); see also *infra* ¶ 40.

¹¹⁵ *NPRM*, 17 FCC Rcd at 12,205 ¶ 62.

¹¹⁶ *Id.* at 12,237 (Appendix B).

¹¹⁷ 47 C.F.R. § 15.255.

¹¹⁸ As shown in Appendix B, the proposed power levels are 9 $\mu\text{W}/\text{cm}^2$ average power and 18 $\mu\text{W}/\text{cm}^2$ peak power, both measured 3 meters from the radiating structure.

in aircraft or satellites.¹¹⁹ The Commission found that this prohibition on airborne and spaceborne use is necessary to protect in-band RAS observations.¹²⁰

39. The Commission also sought comment on providing for operation of unlicensed devices in the 71-76 GHz and 81-86 GHz bands.¹²¹ In the *NPRM*, the Commission reasoned that unlicensed use of this spectrum could provide additional bandwidth for high capacity, short-range communications and other new and unique communications applications.¹²²

40. *Discussion. 92-95 GHz.* The record before us shows that there is considerable interest in using the 92-95 GHz band for unlicensed, Part 15 devices.¹²³ As previously stated, the FWCC points out that unlicensed devices are ideal for a wide range of applications which require low cost or rapid installation and successfully underlay other applications in the same spectrum.¹²⁴ According to NTIA, the NSF has concluded that Part 15 devices restricted to indoor use and no airborne applications would pose no sharing problems for United States radio astronomy facilities under any of the possible 92-95 GHz band plans listed in the *NPRM*.¹²⁵ NTIA believes that locating harmful interference into the RAS from unlicensed outdoor devices would be near to impossible since unlicensed users are not registered.¹²⁶ We are persuaded that allowing unlicensed devices in this band will spur innovative applications just as in other bands where unlicensed devices are allowed.¹²⁷ Accordingly, we will permit Part 15 devices in the 92-95 GHz band for indoor use, but prohibit airborne and spaceborne applications in this band.

41. *71-76 GHz and 81-86 GHz.* Generally, commenters contemplate two-way use of the 71-76 GHz and 81-86 GHz bands, and do not advocate the use of unlicensed devices here.¹²⁸ Loea explains that the equipment that has been developed for deployment in the 71-76 GHz and 81-86 GHz bands was not

¹¹⁹ This flexibility follows the precedent set in 47 C.F.R. § 15.407(e) for the Unlicensed National Information Infrastructure band.

¹²⁰ *NPRM*, 17 FCC Rcd at 12,205 ¶ 62; *see* 47 C.F.R. § 15.255(a).

¹²¹ *NPRM*, 17 FCC Rcd at 12,206 ¶ 63.

¹²² *Id.*

¹²³ FWCC Comments at 7; Wi-Fi Comments at 3; WCAI Comments at 12; Comsearch Reply at 2; NAS Comments at 9 (supports prohibition on airborne and space-borne use of Part 15 devices and sets forth acceptable criteria to reduce the range for harmful interference from a single unit to values acceptable for RAS).

¹²⁴ FWCC Comments at 7.

¹²⁵ *See* NTIA Reply at 10.

¹²⁶ *Id.* at 8-10.

¹²⁷ *See* Griff Witte, *Bringing Broadband Over the Mountain*, The Washington Post, Sept. 15, 2003, at E-1 (describes how rural customers who are not served by main stream ISPs have access to broadband via unlicensed spectrum); *see also* Comsearch Reply at 2 (advocating outdoor unlicensed use only if accompanied by a registration/coordination process).

¹²⁸ *See, e.g.*, Loea Comments at 16; Terabeam Reply at 4; Cisco Comments at 20-21; Sprint Comments at 6.

engineered to operate in a Part 15 unlicensed environment.¹²⁹ As such, an underlay of unlicensed devices here could detrimentally affect the quality, and thus, buildout of service. In addition, we believe that the 92-95 GHz band will provide adequate spectrum to fill the immediate demand for unlicensed devices in millimeter wave bands.¹³⁰ We also believe that the pairable segments in 71-76 GHz and 81-86 GHz bands are more likely to be used for fixed services than the unpaired 92-95 GHz band segments, so the 92-95 GHz band is more conducive to unlicensed use. Accordingly, we will not permit the use of unlicensed devices in the 71-76 GHz and 81-86 GHz bands at this time. We reserve discretion to revisit this decision as the services in these bands mature and new technology is developed regarding sharing.

D. Rules for Licensed Bands

1. Introduction

42. We believe that a flexible licensing approach will allow licensees freedom to determine the services to offer and the technologies to use in providing these services. We also believe that any approach we take must be consistent with our responsibility to promote the provision of communications services to all Americans throughout all parts of the United States and to promote diverse ownership of communications service providers via a variety of platforms. Licensed operations allow the Commission the opportunity to review applicant qualifications and to obtain contact information, should the need arise. We have determined that the following licensing approach allows licensees to make the most efficient use of their assigned spectrum in response to market forces, which will advance the public interest.

2. Operational Rules

a) Non-exclusive Nationwide Licensing

43. *Background.* In the *NPRM*, the Commission sought comment on Loea's proposal to adopt a nationwide licensing scheme with site-by-site coordination.¹³¹ Loea explained that each applicant would file a single application with the Commission for blanket, nationwide authority to provide service in the 71-76 GHz, 81-86 GHz and 92-95 GHz bands. Under Loea's proposal, once the Commission has passed on the applicant's qualifications and granted the license, the licensee would be required to obtain authorization from an independent coordinator in order to construct and operate transmission paths anywhere in the United States.¹³² If interference were predicted, the application would be amended at the

¹²⁹ Loea Comments at 18. Cisco states that the equipment itself is likely to be different: Unlicensed devices are predominately plug-and-play, consumer-type devices, and licensed devices will require installation and either roof rights or tower leases. Cisco Comments at 21.

¹³⁰ *Cf. supra*, ¶ 19 (declining to allocate spectrum for secondary amateur-satellite operations in the 71-76 GHz and 81-86 GHz bands because adequate millimeter wave amateur spectrum is available, and an amateur allocation could complicate coordination).

¹³¹ *NPRM*, 17 FCC Rcd at 12,206-07 ¶ 65.

¹³² Loea Comments at 19.

coordination stage.¹³³ The Commission also sought comment on whether to adopt a geographic licensing approach and, if so, on what service area definition¹³⁴ and coordination process¹³⁵ would be appropriate.

44. *Discussion.* Commenters overwhelmingly favor nationwide licensing conditioned upon site (path) specific coordination.¹³⁶ They explain that the use of geographic area licensing is not appropriate in these bands, where scope and ubiquity of geographic coverage is not expected to be an important feature of either carrier or private entity operations and where the use of spectrum by one entity in a geographic area very rarely precludes the re-use of that spectrum by another entity due to the highly directional point-to-point “pencil-beam” transmissions.¹³⁷ Moreover, some commenters believe that a geographic area licensing approach would force the Commission either to channelize the bands (reducing data capacity),¹³⁸ or artificially create spectrum scarcity where none need exist.¹³⁹ In addition, Loea avers that the entry costs under a nationwide blanket licensing scheme would be less burdensome than those associated with a geographic area/competitive bidding licensing scheme or the fees that must be paid when separate authorizations are provided on a site-by-site basis.¹⁴⁰ Commenters also suggest that a nationwide blanket licensing scheme would reduce the administrative burdens on the Commission that are associated with traditional site-by-site licensing.¹⁴¹ On the other hand, Winstar contends that at least fifty percent of the spectrum at issue should be licensed on an exclusive basis, and that at least part of each of the three bands should be auctioned on a geographic basis.¹⁴²

45. We find that the public interest would be served by authorizing the use of these bands through a non-exclusive licensing scheme combined with the site-specific coordination and registration process set out below. We base this conclusion on the unique characteristics of these spectrum bands, the technical characteristics of the technologies proposed for use in these bands, and the need to share these bands with other services including Federal Government systems that are also under development at this time. Systems proposed for these bands concentrate radiated power in a very narrow path and have considerable attenuation at much shorter distances than occurs in the lower microwave bands. In

¹³³ *NPRM*, 17 FCC Rcd at 12,206-07 ¶ 65.

¹³⁴ *Id.* at 12,207 ¶ 66.

¹³⁵ *Id.* at 12,207 ¶ 67.

¹³⁶ *See, e.g.*, BGI Comments at 1; Boeing Comments at 5-6; Cisco Comments at 18; Comsearch Comments at 3,7; EDS Comment at 1; Endwave Comments at 4-5; FWCC Comments at 10; Harris Comments at 8, 10; KCC Comments at 1; Loea Comments at 16-18, 20; NRAO Comments at 1; National Academies Comments at 8; NTIA Reply at 4-5, 15 (using the terms “band manager” and “coordinator” interchangeably); Sprint Comments at 6; Terabeam Comments at 4, 9-10; WCAI Comments at 15-17.

¹³⁷ *See, e.g.*, Comsearch Comments at 3-4; Loea Comments at 22; Terabeam Comments at 8; WCAI Comments at 16.

¹³⁸ Cisco Comments at 17.

¹³⁹ WCAI Comments at 16.

¹⁴⁰ *See* Loea Comments at 21.

¹⁴¹ *See, e.g.*, Cisco Comments at 18-21; Loea Comments at 21-22.

¹⁴² Winstar Reply Comments at 3.

particular, the millimeter wave spectrum is subject to higher free space losses (a 0.65 kilometer path at 92 GHz produces the same loss as a 10 kilometer path at 6 GHz, namely, 128 dB), and the millimeter wave antennas that commenters envision would be used in these bands concentrate energy in a very narrow path (typically 0.4 degrees half power aperture at 92 GHz as opposed to 5.8 degrees at 6 GHz). The record indicates that these systems may be engineered to operate in close proximity to other systems so that many operations can co-exist in the same vicinity without causing interference to one another.¹⁴³ In spectrum bands with these characteristics, we believe this approach could be particularly beneficial in less-densely populated rural and suburban areas,¹⁴⁴ where there is an even lower chance of interference. Thus, it is appropriate that we facilitate the sharing of the spectrum among multiple users, which we believe can facilitate the provision of communications services to underserved areas. Moreover, we believe that a non-exclusive licensing approach will allow multiple entities to access the spectrum that has been historically shared with the Federal Government and thereby encourage the provision of new millimeter wave technologies and communications services. Such an approach will allow both non-Federal and Federal Government systems to share these bands while evolving their systems to meet uncertain future needs and requirements. Accordingly, we will implement non-exclusive, nationwide licensing with site-by-site coordination with the Federal Government for the 71-76 GHz, 81-86 GHz and 92-95 GHz bands.¹⁴⁵ For the purposes of non-Federal Government licensee interaction with each other, instead of requiring prior coordination of all prospective links, we will institute the registration mechanism described below, which will provide priority based on date/time of application in any cases in which interference may arise.

46. In this connection, applicant qualification for these non-exclusive nationwide licenses will be assessed in accordance with FCC Form 601 and Commission rules. Those applicants who are approved will each be granted a single, non-exclusive nationwide license.¹⁴⁶ There is no limit to the number of non-exclusive nationwide licenses that may be granted for these bands, and these licenses will serve as a prerequisite for registering individual links. The initial filing date for these licenses will be announced in a future Wireless Telecommunications Bureau (WTB) *public notice*. Operations will be authorized through the registration and coordination process established herein.

47. Each licensee will be able to operate on up to all 12.9 GHz of co-primary spectrum. As noted above, we also are dividing the 71-76 GHz and 81-86 GHz bands into four segments each (eight total), and the portions of the 92-95 GHz band on which non-Federal Government operations are divided into two segments (92-94 GHz and 94.1-95 GHz). The decisions to permit licensees to operate on up to all 12.9 GHz of spectrum and to segment the spectrum are complementary. This spectrum will not be subject to any aggregation limit, so each licensee can use as many segments as it needs. As noted above,

¹⁴³ See, e.g., Comsearch Comments at 3-4; Loea Comments at 22; Terabeam Comments at 8; WCAI Comments at 16.

¹⁴⁴ For example, Loea states that it has been testing point-to-point technology in the 71-76 GHz and 81-86 GHz bands in Hawaii.

¹⁴⁵ Because licenses will be non-exclusive, there will be no mutual exclusivity between or among applications. Consequently, our competitive bidding authority is not implicated. See *BBA Report and Order*, 15 FCC Rcd at 22,715 ¶ 14. Given that we are not authorizing licenses via competitive bidding, we have no need to address in this *Report and Order* the various competitive bidding-related issues that were raised in the *NPRM*, which included matters of competitive bidding design, designated entities, bidding credits, application and payment procedures, reporting requirements, collusion issues, and unjust enrichment. See *NPRM*, 17 FCC Rcd 12,223-28 ¶¶ 104-116.

¹⁴⁶ 47 C.F.R. §§ 1.913-1.917. FCC Form 601 - *Application for Authorization in the Wireless Radio Service*.

however, we do not believe that every licensee will need 12.9 GHz of spectrum. We believe that segmenting the spectrum will provide licensees the flexibility to use as much spectrum as is needed, facilitate coordination and avoid interference.¹⁴⁷

b) Coordination and Registration

48. *Background.* Because the spectrum at issue is co-allocated on a co-primary basis for both Federal Government and non-Federal Government use, coordination between non-Federal Government (private entities and state and local governments) and Federal Government operations is of critical interest in this proceeding. The classified nature of some Federal Government operations precludes the use of a public database containing both Federal Government and non-Federal Government links, and the existing process requires individual coordination for each link. Thus, another approach is needed.

49. *Discussion.* Commenters generally support the notion of coordination through a third-party entity that would serve as a clearinghouse and repository of site path information and manage the coordination of Federal Government and non-Federal Government links.¹⁴⁸ We agree that we should adopt a streamlined process, particularly in light of the potential for thousands of coordinated paths in these bands. We thus adopt a process under which coordination with Federal Government links will occur via an automated mechanism administered by the NTIA and under which interference protection among non-Federal Government links will be determined by the date/time of individual link registration in a database of such links. In order to minimize the administrative burden of coordination on Commission resources, we reserve the discretion to designate one or more third-party database managers to maintain a repository for the non-Federal Government links, and understand that the NTIA intends to maintain the repository for Federal Government links. Accordingly, we adopt the following coordination procedures.

50. *Database managers of non-Federal Government links.* Non-Federal Government links are to be registered in a third-party (*i.e.*, non-FCC) database, which will be open to all interested parties for review.¹⁴⁹ We define the rights and responsibilities of a database manager as follows. A database manager will have access to its own database as well as NTIA's planned automated coordination mechanism (as discussed below), and must make its services available to all parties on a first-come, first-served, non-discriminatory basis.¹⁵⁰ If more than one database manager is selected, they will use a single, shared database.¹⁵¹ A database manager will provide for the registration of requested links but is not required to decide which frequency should be used. Although a database manager is not required to

¹⁴⁷ This is similar to the approach we took in the 4.9 GHz proceeding, where licensees are authorized to operate on any spectrum within the fifty megahertz band, but must follow a spectrum utilization plan. *See 4.9 GHz Third R&O*, 18 FCC Rcd at 9167-69 ¶¶ 37-40.

¹⁴⁸ *See, e.g.*, Cisco Comments at 18-19; Comsearch Comments at 5; FWCC Comments at 11; Loea Comments at 19-20; NTIA Reply at 15; WCAI Comments at 19.

¹⁴⁹ Amendment of Parts 2 and 95 of the Commission's Rules to Create a Wireless Medical Telemetry Service, *Report and Order*, ET Docket No. 99-255, 15 FCC Rcd at 11,220 ¶ 42 (2000) (*WMTS R&O*).

¹⁵⁰ *See, e.g., id.* at 11,218 ¶ 33.

¹⁵¹ *See Replacement of Part 90 by Part 88 to Revise the Private Land Mobile Radio Services and Modify the Policies Governing Them, Second Report and Order*, PR Docket No. 92-235, FCC Rcd at 14,332-333 ¶¶ 45-47 (*Refarming 2nd R&O*).

determine whether a proffered link creates a frequency conflict in the context of its database,¹⁵² once notified of an interference complaint, it is required to notify the relevant licensee(s), as set forth below.¹⁵³ A database manager is also permitted to offer optional services to licensees, such as coordination analysis of proposed links with prior-registered links. In addition, the database manager must provide access to the database to NTIA and the Commission.

51. One or more database managers will be selected. We note that in the past the Commission has tried, where appropriate, to introduce market forces into the frequency coordination process, because competition among coordinators promotes cost-based pricing and provides incentives for enhancing customer service,¹⁵⁴ and we expect the benefits of competition to be considered during the selection process. We anticipate written agreements between the Commission and these database managers, as has been done in other contexts.¹⁵⁵ We have not found it necessary to set limits on the fees charged by coordinators in other services,¹⁵⁶ and we have no reason to believe that fee limits will be necessary here. Accordingly, we will allow the designated database manager to set the fee structure as necessary to recoup costs. Proposals will be solicited from interested parties in a future *public notice* by Commission staff. After the selection process is complete, another *public notice* will be released announcing how licensees may register their links.

52. *Permanent registration.* On a going-forward basis, we are working cooperatively with NTIA to facilitate an innovative, streamlined process that will enable licensees to expedite service to the public.¹⁵⁷ The plan for the non-Federal Government links is comprised of two components: (a) Non-Federal Government link coordination with the Federal Government, and (b) registration of non-Federal Government links in a database. In addition, there is a separate coordination process that commences when the Federal Government seeks to coordinate its links with non-Federal Government links. The new procedures we are adopting are as follows:

53. *Supporting data.* A licensee must generally supply the following data for each requested site: call sign, site coordinates, site elevation, antenna centerlines, azimuth and elevation angle (receive and

¹⁵² *WMTS R&O*, 15 FCC Rcd at 11,218 ¶ 33.

¹⁵³ See *infra* para. 58.

¹⁵⁴ See *Refarming R&O*, 14 FCC Rcd at 14,328 ¶ 40.

¹⁵⁵ A Memorandum of Understanding (MOU) will be effective upon execution. See, e.g., Amendment of Parts 2 and 95 of the Commission's Rules to Create a Wireless Medical Telemetry Service, *Order*, ET Docket 99-255, 16 FCC Rcd 4543, 4551 ¶ 48 (WTB PSPWD 2001).

¹⁵⁶ Amendment of Parts 2 and 95 of the Commission's Rules to Create a Wireless Medical Telemetry Service, *Report and Order*, ET Docket No. 99-255, 15 FCC Rcd 11,206, 11,218-19 ¶ 36 (2000) (*WMTS R&O*).

¹⁵⁷ The anticipated NTIA web-site differs from the third-party database in that the NTIA web-site will contain Federal Government links, which will not be directly accessible to non-Federal Government entities (such as third-party database managers and licensees), and the third-party database will contain non-Federal Government links as well as the result of the coordination process (registration, as well as date of attempted registration pending the outcome of IRAC coordination).

transmit), antenna types (receive and transmit), emission type, EIRP, equipment manufacturer and model, transmit and receive frequencies.¹⁵⁸ This information is set forth with more specificity in Appendix C.

54. Part A: Coordination of Non-Federal Government with Federal Government links. As a result of ongoing discussions with the NTIA, we understand that NTIA will be developing an automated mechanism that will determine whether proposed non-Federal Government operations may interfere with Federal Government operations.¹⁵⁹ It is anticipated that this automated mechanism will help to ensure that non-Federal Government licensees protect prior-registered Federal Government operations, radio astronomy sites, and satellite earth station sites listed in footnote US389. We understand that information regarding a proposed non-Federal Government link will be entered into the NTIA automated mechanism by either the database manager or an FCC licensee in these bands. The automated mechanism will then transmit either a “green light” or a “yellow light,” *i.e.*, it will indicate whether the proposed link poses any potential harmful interference to Federal Government (or non-Federal Government RAS) users. Upon receipt of a green light, the link will be deemed to have been coordinated with the Federal Government. It is anticipated that a green light will trigger almost-instantaneous registration. This coordination process is thus analogous to the registration of a personalized license plate in Virginia, where a vehicle owner can enter a proposed personalized license plate into the website of the Department of Motor Vehicles, and receive immediate feedback concerning whether the requested tag is available.¹⁶⁰ If a yellow light is received, the licensee must file an application for the requested link with the Commission, which in turn will submit the application to the Interdepartment Radio Advisory Committee (IRAC)¹⁶¹ for individual coordination as under current procedures.¹⁶² A third-party database manager will record the date/time and coordinates of the requested link and flag it as requiring IRAC coordination, in order to protect the licensee’s interference rights as against other non-Federal Government licensees (discussed *infra*). Thus, protection rights for a link that requires IRAC coordination is triggered on the initial date that the link is submitted to NTIA.

55. Part B: Registration of Non-Federal Government links. A non-Federal Government licensee must receive a green light from the NTIA coordination website or IRAC approval before a link registration can take effect for interference protection purposes. Upon receipt of NTIA approval, a third-party database manager will ensure that the link registration will take effect in the third-party database. No further action is needed, unless a database manager is notified of an interference complaint. Such notification triggers formal interference protection procedures (discussed *infra*).

¹⁵⁸ In addition, for some proposed links, the licensee will have to submit documentation that an individual application has been filed with the Commission. *See infra* ¶ 62.

¹⁵⁹ We understand that the entity entering the proposed path data into the NTIA website will not have direct access to the underlying information regarding specific Federal Government sites.

¹⁶⁰ *See* www.dmv.state.va.us/dmvnet/plate_purchase/select_plate.

¹⁶¹ The IRAC consists of a representative appointed by each of approximately twenty member Federal departments and agencies together with such other departments and agencies as NTIA might designate. The IRAC's substructure consists of the Frequency Assignment Subcommittee (FAS), the Spectrum Planning Subcommittee (SPS), the Technical Subcommittee, the Radio Conference Subcommittee, Emergency Planning Subcommittee, the International Notification Group, and a number of ad hoc working groups. Liaison between the IRAC and the FCC is effected by a representative appointed by the FCC to serve in that capacity.

¹⁶² Under a yellow light scenario, a licensee may be required to submit additional information, such as the antenna pattern. Given the “pencil-beam” character of millimeter waves, we do not expect yellow lights to be common.

56. In addition, the following types of non-Federal Government links require the filing of an FCC Form 601 for each link for the purpose of registration and coordination, in addition to being registered in the third-party database: (1) facilities requiring the submission of an Environmental Assessment,¹⁶³ (2) facilities requiring international coordination,¹⁶⁴ and (3) operation in quiet zones.¹⁶⁵ The Commission believes the licensee is in the best position to determine the nature of its operations and whether those operations impact these settings. Consequently, the licensee will be required to submit to a database manager, as part of the registration package, documentation that an FCC Form 601 has been filed.

57. Federal Government with Non-Federal Government. The NTIA will be able to check a proposed Federal Government link against the third-party database. Federal Government users must protect prior-registered non-Federal Government links.¹⁶⁶ We note that airborne radio location systems are understood to be compatible with all applications in the 92-95 GHz band. Thus, these systems will not be part of the coordination or interference protection procedures.

58. Formal Interference Protection Procedures. Formal interference protection procedures are initiated when a third-party database manager is notified of harmful interference. Interference protection rights are date-sensitive and are based either on the date NTIA coordination is triggered (in the case of a yellow light), or on the date that the link is first registered (in the case of a green light). In the event of harmful interference,¹⁶⁷ the first-in-time registered link is entitled to protection, and the later-in-time registered link must be discontinued or modified to resolve the problem. Thus, a licensee who experiences harmful interference should report this to the database manager, who identifies the problem link. If the complaining licensee's link is not first-in-time, the third-party database manager will explain that the licensee can either accept the interference or move the link. If the complaining licensee's link is first-in-time, the database manager will inform the later-registered overlapping operator, who must resolve any identified interference immediately. We anticipate that licensees will resolve any identified complaints among themselves. However, if the complaining licensee is not satisfied that any interference has been resolved, then after thirty days, a complaint may be filed with the Commission. The Commission will resolve unsolved disputes on a case-by-case basis and may instruct the database manager to remove the offending link from the registry. Where it appears that Federal Government operations are a source of interference to non-Federal Government licensees, the Commission will work with NTIA to resolve the issue. Similarly, where it appears that non-Federal Government licensees are a source of interference to Federal Government operations, the Commission will work with NTIA to resolve the issue.

59. Implementation. NTIA has indicated that it believes it can make the initial version of the automated mechanism available within four months of an agreement on the framework of the coordination procedure. Thus, within four months of the publication of this *Report and Order* in the *Federal Register*, Commission staff, in conjunction with the NTIA, will release a *public notice*

¹⁶³ See 47 C.F.R. § 1.1307.

¹⁶⁴ See, e.g. 47 C.F.R. § 1.928 (regarding frequency coordination arrangements between the United States and Canada).

¹⁶⁵ 47 C.F.R. § 1.924.

¹⁶⁶ See ¶ 25, *supra*.

¹⁶⁷ We consider harmful interference to exist when a threshold-to-interference ratio (T/I) is determined to cause 1.0 dB of degradation to the static threshold of the protected receiver.

specifically explaining how the coordination of non-Federal Government links with Federal Government users will work, the information that users will enter into the system, what these users will receive in response to the data entered, who will maintain the system and when the system will commence operations. In addition, at that time, Commission staff will announce via *public notice* the start-date for the new procedure that we adopt herein for mitigating interference among non-Federal Government links.

60. *Interim process.* Between the time that WTB begins accepting applications for non-exclusive licenses and the implementation of the new procedures adopted herein, coordination of non-Federal Government links with Federal Government operations will be accomplished under the existing coordination process. Each link must be registered in the Commission's Universal Licensing System (ULS) and also requires coordination with NTIA through IRAC. While this interim process remains in effect, NTIA has informed us, it will, through the IRAC's Frequency Assignment Subcommittee, coordinate private sector requests within fourteen working days of receipt.¹⁶⁸ We do not believe that the IRAC coordination process will be burdensome on the Commission or NTIA resources on a temporary basis because we do not anticipate that many licensees will seek to register links until the necessary mechanisms are in place, and until approved equipment becomes commercially available.

c) Satellite Earth Stations

61. FSS, MSS, and Broadcast Satellite Service (BSS) have co-primary allocations in various portions of these bands. In addition, the possibility exists that both geostationary satellite orbit (GSO) and non-geostationary satellite orbit (NGSO) satellites will be transmitting in portions of the 71-76 GHz FSS, MSS, and BSS downlink bands. This section addresses satellite and terrestrial entities that eventually seek to obtain licenses in these bands and potential coordination between these operations. The Commission's Rules relating to satellite operations are contained in Part 25.¹⁶⁹ In this regard, we note that we must take further action under Part 25 of our Rules for earth stations to operate in the 71-76 GHz (downlink) and 81-86 GHz (uplink) bands.

62. Although satellite operations are allocated for portions of the 71-76 GHz and 81-86 GHz bands, the Commission has not yet permitted such use. Until a future proceeding is completed, entities seeking to provide satellite operations under a separate Part 25 license need to have some assurance that the terrestrial licensees will coordinate or otherwise accommodate the satellite operations. However, because the satellite industry has not developed technical parameters for operations in the 71-76 GHz and 81-86 GHz bands, we cannot derive precise methods upon which to coordinate or allow the use of the various stations that may operate in these bands. Therefore, we will maintain multiple services in the allocation table and address possible sharing criteria in the future.

63. Therefore, all terrestrial 71-76 GHz and 81-86 GHz band entities are hereby made aware that future operations of satellite and satellite earth stations could be permitted in the 71-76 GHz and 81-86 GHz bands. Once the Commission considers and adopts technical standards for terrestrial and satellite

¹⁶⁸ NTIA has further indicated that it will provide a website indicating the applications that it has received from the Commission, the date received, the date action is complete, and the status. NTIA will provide the location of that site via a public notice.

¹⁶⁹ 47 C.F.R. Part 25.

operations to share this spectrum, all licensees will be expected to satisfy these and any other Part 101 requirements.

d) Eligibility

(1) Foreign Ownership

64. *Background.* As noted in the *NPRM*, licensees in the 71-76 GHz, 81-86 GHz and 92-95 GHz will be subject to section 310(a), which prohibits the granting of any license to be held by a foreign government or its representative, and may be subject to Section 310(b), which prohibits the grant of a common carrier license to an applicant who fails any of the four citizenship requirements listed therein. Thus, Section 101.7 of the Commission Rules, which implements Section 310 of the Act, as amended, will be applied to the subject bands.

65. Further, the Commission noted¹⁷⁰ that in response to its commitments under the World Trade Organization (WTO) Basic Telecommunications Agreement, the Commission liberalized its policy for applying its discretion with respect to foreign ownership of common carrier radio licensees under Section 310(b)(4).¹⁷¹ Under its new policy, the Commission now presumes that ownership by entities from countries that are WTO members serves the public interest.¹⁷² Ownership by entities from countries that are not WTO members continues to be subject to the "effective competitive opportunities" potential established earlier by the Commission.¹⁷³

66. *Discussion.* Based on the reasons stated in the *NPRM*, we will apply Section 101.7 of the Commissions Rules without modification to the subject bands. As the Commission has done in the case of the Multipoint Distribution Service (MDS), satellite service, and the Local Multipoint Distribution Service (LMDS), we will require an applicant electing non-common carrier status to also submit the same information that common carriers applicants must submit in order to address the alien ownership restrictions under Section 310(b) of the Act.¹⁷⁴ Because the subject licensees are permitted to offer both common and non-common carrier services, we believe that this requirement is necessary in order to

¹⁷⁰ *NPRM*, 17 FCC Rcd at 12,210 ¶ 75.

¹⁷¹ The commitments are incorporated into the General Agreement of Trade in Services (GATS) by the Fourth Protocol to the GATS. See Fourth Protocol to the General Agreement on Trade in Services (WTO 1997), 36 I.L.M. 366 (1997).

¹⁷² See Rules and Policies on Foreign Participation in the U.S. Telecommunications Market and Market Entry and Regulation of Foreign-Affiliated Entities, *Report and Order and Order on Reconsideration*, IB Docket No. 95-22, 12 FCC Rcd 23891, 23935-47, ¶¶ 97-132 (1997) (*Foreign-Affiliated Entities Report and Order on Reconsideration*).

¹⁷³ *Id.*

¹⁷⁴ See Revisions to Part 21 of the Commission's Rules regarding the Multipoint Distribution Service, *Report and Order*, CC Docket No. 86-179, 2 FCC Rcd 4251, 4253 ¶ 16 (1987); Streamlining the Commission's Rules and Regulations for Satellite Application and Licensing Procedures, *Report and Order*, IB Docket No. 95-117, 11 FCC Rcd 21581, 21599 ¶ 43 (1996); Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules for Local Multipoint Distribution Service and for Fixed Satellite Services, *Second Report and Order, Order on Reconsideration, and Fifth Notice of Proposed Rule Making*, CC Docket No. 92-297, 12 FCC Rcd 12,545, 12,651 ¶ 243 (1997).

enable us to ascertain compliance of all licensees with the alien ownership restrictions set forth in Section 101.7 of the Commission's Rules. This information can be used whenever the licensee changes to common carrier status without imposing an additional filing requirement when the licensee makes the change.¹⁷⁵ We note, moreover, that we would not disqualify an applicant requesting authorization exclusively to provide non-common carrier service from obtaining a license solely on the basis that its citizenship information would disqualify it from receiving a common carrier license.

67. Accordingly, common carrier and non-common carrier licensees will be required to provide the alien ownership information requested by FCC Form 601. Moreover, both common carriers and non-common carriers must amend their FCC Form 602 to reflect any changes in foreign ownership information.

(2) Eligibility Restrictions

68. *Background.* In the *NPRM*, the Commission sought comment on whether any eligibility restrictions are appropriate for the 71-76 GHz, 81-86 GHz and 92-95 GHz bands.¹⁷⁶ Loea and others support the Commission's decision not to impose any eligibility restrictions.¹⁷⁷

69. In Section 257 of the Act, Congress articulated a "national policy" in favor of "vigorous economic competition" and the elimination of barriers to market entry by a new generation of telecommunications providers.¹⁷⁸ Toward that end, the Commission has created a standard for determining whether an eligibility restriction is warranted for certain services.¹⁷⁹ Specifically, this standard demands that an eligibility restriction be imposed only when there is significant likelihood of substantial harm to competition in specific markets and when the restriction will be effective in eliminating that harm.¹⁸⁰ This standard involves examining a number of market facts and circumstances, including economic incentives, barriers to entry, and potential competition.¹⁸¹ In addressing the issue of eligibility restrictions in the *NPRM*, the Commission sought to determine whether open eligibility imposes a significant likelihood of substantial competitive harm in specific markets, and, if so, whether eligibility restrictions are an effective way to address that harm.¹⁸²

¹⁷⁵ We note, however, that to the extent that a licensee's decision to change its regulatory status raises issues with respect to that licensee exceeding the benchmark contained in Section 310(b)(4), the rules require the Commission's prior approval before the licensee can make this change. *Foreign-Affiliated Entities Report and Order on Reconsideration*, 12 FCC Rcd at 23,891, 23,940-41 ¶¶ 111-118.

¹⁷⁶ *NPRM*, 17 FCC Rcd 12,211-12 ¶¶ 77-78.

¹⁷⁷ Cisco Comments at 22; Loea Reply at 17.

¹⁷⁸ See 47 U.S.C. § 257.

¹⁷⁹ See, e.g., *39 GHz R&O*, 12 FCC Rcd at 18,617-19 ¶¶ 30-33.

¹⁸⁰ *Id.* at 18,619 ¶ 32.

¹⁸¹ Rule Making to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Services and for Fixed Satellite Services, *Third Order on Reconsideration*, CC Docket No. 92-297, 13 FCC Rcd 4856, 4861 ¶ 7, 4863 ¶ 12 (1998).

¹⁸² *NPRM*, 17 FCC Rcd at 12,212 ¶ 78.

70. *Discussion.* As the development of the “substantial competitive harm” standard suggests, the Commission has in recent years sought to promote open competition and has favored reliance on market forces to guide license assignment absent a compelling showing that regulatory intervention to exclude potential participants is necessary.¹⁸³ In this proceeding, we have adopted a licensing approach that is a hybrid that combines the “exclusive use”¹⁸⁴ and the “commons”¹⁸⁵ models, which rely primarily on technical rules to protect spectrum users against interference. We find that under this approach there is no significant likelihood of competitive harm in any markets and therefore no compelling reason to impose eligibility restrictions. We believe that opening the 71-76 GHz, 81-86 GHz and 92-95 GHz bands to as wide a range of applicants as possible will encourage new entry and investment as well as entrepreneurial efforts to develop new technologies and services, while helping to ensure efficient spectrum use. We further believe that this approach will promote economic opportunity and competition in the subject bands.

(3) Spectrum Leasing

71. *Background.* In the *BBA Report and Order*, the Commission recognized the use of band managers as a future option for spectrum licensing.¹⁸⁶ Band managers are a class of licensees that lease their spectrum to other entities through private, written agreements. In the *NPRM*, the Commission requested comment on whether band managers would be appropriate in a geographic area licensing context.¹⁸⁷ More recently, we adopted the *Secondary Markets Report and Order*, in which we facilitate and streamline the ability of spectrum users to gain access to licensed spectrum by entering into spectrum leasing arrangements with licensees in our Wireless Radio Services that hold exclusive rights to the spectrum.¹⁸⁸

¹⁸³ See, e.g., Amendment of Parts 1, 21, 73, 74 and 101 of the Commission’s Rules to Facilitate the Provision of Fixed and Mobile Broadband Access, Educational and Other Advanced Services in the 2150-2162 and 2500-2690 MHz Bands, *Notice of Proposed Rule Making and Memorandum Opinion and Order*, WT Docket No. 03-66, 18 FCC Rcd 6722, 6773 ¶ 121 (2003). See also Spectrum Policy Task Force Report, ET Docket No. 02-135, at 5 (Nov. 2002) (“it is important that the Commission continue to optimize and facilitate access to and use of the radio spectrum”).

¹⁸⁴ “Exclusive use” is a licensing model in which a licensee has exclusive and transferable rights to the use of specified spectrum within a defined geographic area, with flexible use rights that are governed primarily by technical rules to protect spectrum users against interference. Under this model, exclusive rights resemble property rights in spectrum, but this model does not imply or require creation of “full” private property rights in spectrum.

¹⁸⁵ The “commons” model allows unlimited numbers of unlicensed users to share frequencies, with usage rights that are governed by technical standards or etiquettes but with no right to protection from interference. Spectrum is available to all users that comply with established technical “etiquettes” or standards that set power limits and other criteria for operation of unlicensed devices to mitigate potential interference.

¹⁸⁶ *BBA Report and Order*, 15 FCC Rcd at 22727-35 ¶¶ 35-50.

¹⁸⁷ *NPRM*, 17 FCC Rcd at 12,212 ¶ 79.

¹⁸⁸ See generally Promoting Efficient Use of Spectrum Through Elimination of Barriers to the Development of Secondary Markets, *Report and Order and Further Notice of Proposed Rule Making*, WT Docket No. 00-230, FCC 03-113 (rel. Oct. 6, 2003) (*Secondary Markets Report and Order*). Here, “spectrum lessees” refer to those entities that lease spectrum usage rights licensed by the Commission to other entities.

72. *Discussion.* Comsearch believes that if the Commission selects a geographic area licensing scheme, then band managers must be included among the eligible licensees in order to ensure the availability of spectrum to multiple users.¹⁸⁹ However, many commenters do not favor the use of band manager licensing here, because the low risk of interference precludes mutual exclusivity and enables the Commission to award licenses through a low-cost, streamlined process.¹⁹⁰ Thus, commenters aver that band managers would impose unnecessary costs on spectrum users.¹⁹¹ Moreover, Loea explains that the existing band manager construct grants title to the license to the band manager, and not the service provider, thus rendering end user service vulnerable to the financial position of the manager.¹⁹² In the context of the 71 and 81 GHz spectrum, Loea believes that band managers would impede the development of services because few would be willing to invest in networks if their use is based on a revocable license held by a third-party over which they have no control.¹⁹³

73. Under the nationwide, non-exclusive licensing approach we adopt in this *Report and Order* today, we believe that licensees will be given optimal flexibility when developing and deploying these spectrum bands. The licensing scheme we employ here will permit an almost unlimited amount of access. In addition, there will be a high degree of spectrum re-use in these bands, combined with the unlikelihood of harmful interference. Accordingly, the traditional licensing and spectrum leasing arrangements as described in the *Secondary Markets Report and Order* are not applicable,¹⁹⁴ and we do not see a need to apply those spectrum leasing rules and policies to the millimeter wave spectrum at this time.

e) Canadian and Mexican Coordination

74. *Background.* As noted in the *NPRM*, there are no current international agreements between and among the United States, Mexico and Canada with regard to the subject 71-76 GHz, 81-86 GHz and 92-95 GHz bands.¹⁹⁵ However, as a general rule, wireless operations must not cause harmful interference across the Canadian and Mexican borders.

75. *Discussion.* In order to ensure that 71-76 GHz, 81-86 GHz and 92-95 GHz band operations do not cause harmful interference across our Canadian and Mexican borders, we will apply the restrictions at the border that are found in 1.928(f)¹⁹⁶ of our rules for both Mexico and Canada. If, in the future,

¹⁸⁹ Comsearch Comments at 9. Comsearch does not address any specific issues concerning such implementation.

¹⁹⁰ BGI Comments at 1; Cisco Comments at 17; Comsearch Comments at 9; EDS Comment at 1; Harris Comments at 9; KCC Comments at 1; Loea Comments at 26-27; Loea Reply at 16; Sprint Comments at 7; Terabeam Comments at 14; WCAI Comments at 17-20.

¹⁹¹ Loea Reply at 16; WCAI Comments at 17.

¹⁹² Loea Reply at 16.

¹⁹³ *Id.* at 16-17.

¹⁹⁴ See *Secondary Markets Report and Order* at ¶ 84 (spectrum leasing policies apply to services in which licensees hold exclusive use rights with respect to the spectrum).

¹⁹⁵ *NPRM*, 17 FCC Rcd at 12,214 ¶ 82.

¹⁹⁶ 47 C.F.R. § 1.928(f).

coordination agreements between and among the United States, Mexico and Canada should arise, we will require that licensees comply with the provisions contained in those agreements.

f) License Term

76. *Background.* In the *NPRM*, the Commission sought comment on the appropriate license term for licensees in the 71-76 GHz, 81-86 GHz and 92-95 GHz bands.¹⁹⁷ It also noted that licenses authorized under Part 101 of our Rules are licensed for a period of ten years.¹⁹⁸

77. *Discussion.* Commenters generally support the Commission's proposal to adopt a ten-year license term for each license in the subject bands. We conclude that it is in the public interest to adopt such a ten-year license term. We believe that this approach will provide a stable regulatory environment that will be attractive to investors and, thereby, encourage development of these frequency bands. It will also provide licensees with ample time to develop these spectrum bands as the market demands and to employ innovative technologies that may not be available immediately upon licensing.

g) Other Licensee Obligations

78. *Background.* In the *NPRM*, the Commission sought comment on whether to apply the construction requirements set forth in Section 101.63 of our Rules.¹⁹⁹ Section 101.63 provides, *inter alia*, that licensees authorized under Part 101 of our Rules must be in operation within 18 months from the initial date of grant.²⁰⁰ Section 101.63 further provides that failure to timely begin operation of the station will result in the automatic cancellation of that authorization.²⁰¹ The Commission sought comment on this construction requirement, as well as alternative construction requirements, for site-based licenses in these bands.

79. *Discussion.* Loea, WCAI and others believe that each site-based license should include a condition providing that once a licensee obtains approval for any individual path, it must complete construction of that path within six months, a shorter period than other Part 101 site-based licenses. These parties believe that this shorter construction period will keep licensees from arbitraging high-value paths.²⁰² Cisco seeks to further compress the construction requirement, giving each licensee up to 120 days to complete construction and bring any given link into regular use, commencing upon FCC licensing of the path in question in the case of the initial link. In the case of subsequent links, Cisco believes that the construction requirement should commence upon notification by the band manager that the path in question has been successfully coordinated and notified to the Commission.²⁰³

¹⁹⁷ *NPRM*, 17 FCC Rcd at 12,214 ¶ 83.

¹⁹⁸ See 47 C.F.R. § 101.67.

¹⁹⁹ *NPRM*, 17 FCC Rcd at 12,216 ¶¶ 86-87.

²⁰⁰ See 47 C.F.R. § 101.63(a).

²⁰¹ See 47 C.F.R. § 101.63(b).

²⁰² Harris Comments at 11-12; Loea Reply at 11, 17; Terabeam Comments at 15; WCAI Comments at 22. One example of a high-value path is the Empire State Building to the Chrysler Building.

²⁰³ Cisco Comments at 22.

80. The overarching purpose of our requirements in this setting, concerning link construction, modification, and discontinuance, is to ensure that spectrum is put to use and to maintain the integrity of the information in the relevant databases by correctly reflecting the actual record concerning these issues.²⁰⁴ We applaud the aggressive construction requirements set forth in the record, and are persuaded to shorten the traditional 18-month construction requirement to 12 months. Therefore, we will adopt the 12-month construction requirement and revise Section 101.63 of our Rules accordingly for this service. In addition, we clarify that in this setting, each construction period will commence on the date that the third-party database manager registers each link.²⁰⁵ Moreover, at this time, we will not require users to file a notification requirement as mandated by Section 1.946(d) of the Commission's Rules, but will rely on licensees to notify a database manager to withdraw unconstructed links from the database. If a database manager or other user (whether a Federal Government operation or non-Federal Government licensee) finds that a link is unconstructed after the required timeframe, the database manager is instructed to remove it from the registry. In addition, forfeiture and termination of a link will be handled in accordance with Section 101.65 of our rules.²⁰⁶ We reserve the discretion to revisit this issue if our experience indicates that additional measures are necessary.

81. We note that each non-Federal Government link will be permitted to use as many of the 1.25 GHz segments in the 71-76 GHz and 81-86 GHz bands, and as much of the two segments (92-94 GHz and 94.1 to 95 GHz) in the 92-95 GHz band as needed. An entity may request any portion of this spectrum, up to 12.9 GHz, as the licensee wishes. However, commercial licensees will have to meet the loading requirements of Section 101.141 of the Rules which is a minimum of one bit per Hertz. If it is determined that a licensee has not met the loading requirements, then the database will be modified to limit coordination rights to the spectrum that is loaded and the licensee will lose protection rights on spectrum that has not been loaded.²⁰⁷

h) Application of Title II Requirements to Common Carriers

82. *Background.* In the *NPRM*,²⁰⁸ the Commission sought comment on whether it should forbear from applying certain obligations on common carrier licensees in the 71-76 GHz, 81-86 GHz and 92-95 GHz bands pursuant to Section 10 of the Act.²⁰⁹ In the case of CMRS providers, the Commission concluded that it was appropriate to forbear from Sections 203, 204, 205, 211, 212, and most applications

²⁰⁴ In this setting, if the construction requirement is not met, although the licensee will not be barred from constructing later, it will lose the original registration date for the purpose of interference protection procedures.

²⁰⁵ See 47 C.F.R. § 101.63.

²⁰⁶ 47 C.F.R. § 101.65.

²⁰⁷ If it is determined that a licensee has not met the loading requirement, then the database will be modified to limit coordination rights to the spectrum that is loaded. The licensee will lose protection rights on spectrum that has not been loaded.

²⁰⁸ *NPRM*, 17 FCC Rcd at 12,217 ¶ 89.

²⁰⁹ See 47 U.S.C. § 160(a)(1)-(3). This section provides the Commission with authority to forbear from application of virtually any regulation or any provision of the Act to a telecommunications carrier or telecommunications service, or a class of carriers or services. However, the Commission may not forbear from applying the requirements of 47 U.S.C. §§ 251(c) and 271 until it determines that those requirements have been fully implemented. See 47 U.S.C. § 160(d).

of Section 214.²¹⁰ The Commission, however, declined to forbear from enforcing other provisions, including Sections 201 and 202.²¹¹ The Commission also has exercised its forbearance authority in permitting competitive access providers and competitive local exchange carriers to file permissive tariffs.²¹²

83. *Discussion.* WCAI and others urge the Commission to forbear from applying Title II requirements in these bands, in an era of flexible use where CMRS carriers are permitted to provide fixed wireless service and vice-versa,²¹³ and where there is no reason for the Commission to retain an archaic distinction between the two where regulatory forbearance is concerned, particularly given the size of wireless broadband's market share relative to that of cable modem and DSL services.²¹⁴ Cisco avers that Title II regulation is unnecessary because (a) the market is fully competitive, with no incumbents and no barriers to simultaneous entry by any number of independent licensees; (b) the technology is by nature "anti-bottleneck" making it difficult for any carrier to maintain unjust, unreasonable, or discriminatory charges, practices, classifications, or regulations; and (c) enforcement is not necessary for consumer protection because upon dissatisfaction, a customer can operate its own path.²¹⁵

84. While we seek to provide flexible, streamlined service in these bands, we wish to protect common carrier customers from being adversely affected by discontinued, reduced or impaired service.²¹⁶ Therefore, those who seek forbearance from any section of Title II must meet the requirements of Title I, Section 10(a) as follows:

- Enforcement of such regulation or provision is not necessary to ensure that the charges, practices, classifications, or regulations by, for, or in connection with that telecommunications carrier or telecommunications service are just and reasonable and are not unjustly or unreasonably discriminatory;²¹⁷

²¹⁰ See Implementation of Sections 3(n) and 332 of the Communications Act, Regulatory Treatment of Mobile Services, *Second Report and Order*, GN Docket No. 93-252, 9 FCC Rcd 1411, 1478-81 ¶¶ 175-182 (1994).

²¹¹ See *id.*; Personal Communications Industry Association's Broadband Personal Communications Services Alliance's Petition for Forbearance for Broadband Personal Communications Services, Forbearance from Applying Provisions of the Communications Act to Wireless Telecommunications Carriers, *Memorandum Opinion and Order and Notice of Proposed Rulemaking*, WT Docket No. 98-100, 13 FCC Rcd 16857, 16914 (1998) (declining to forbear from applying Section 20.12(b) of the Commission's Rules (resale rule) and Sections 201 and 202 of the Communications Act). See also RegioNet Wireless License, LLC, *Order*, 15 FCC Rcd 16,119 (2000).

²¹² See Hyperion Telecommunications, Inc. Petition Requesting Forbearance, Time Warner Communications Petition for Forbearance, Complete Detariffing for Competitive Access Providers and Competitive Exchange Carriers, *Memorandum Opinion and Order and Notice of Proposed Rulemaking*, CC Docket No. 97-146, 12 FCC Rcd 8596, 8608-10 ¶¶ 24-27 (1997).

²¹³ Cisco Comments at 22; Terabeam Comments at 15; WCAI Comments at 22.

²¹⁴ Terabeam Comments at 15; WCAI Comments at 22.

²¹⁵ Cisco Comments at 23.

²¹⁶ 47 U.S.C. § 214(a).

²¹⁷ See 47 U.S.C. § 160(a)(1).

- Enforcement of such regulation or provision is not necessary for the protection of consumers;²¹⁸ and
- Forbearance from applying such provision or regulation is consistent with the public interest.²¹⁹

85. The commenters have not addressed this issue with sufficient specificity to allow us to conclude that these criteria have been met. Accordingly, we will not forebear from any section of Title II at this time. However, as service in these bands develops, we will consider specific, supported requests for forbearance.

i) Partitioning and Disaggregation

86. *Background.* In the *NPRM*, the Commission proposed to allow licensees to partition their own service areas and to disaggregate their respective spectrum.²²⁰ We allow partitioning and disaggregation in other microwave services, such as the 39 GHz Service²²¹ and LMDS.²²² In a number of recent proceedings, we have adopted a flexible approach for partitioning and disaggregation.²²³ This approach is intended to encourage spectrum efficiency and afford all parties an opportunity to respond to market demands for services and/or spectrum in unserved and underserved areas.²²⁴

87. *Discussion.* The use of partitioning and disaggregation is pertinent in geographic licensing settings where the licensee has exclusive use of a particular area. That is not the case here. Thus, we determine that our decision to authorize these bands on the basis of nationwide non-exclusive licensing obviates the need for partitioning and disaggregation.

E. Technical and Operational Rules

1. Regulation Under Parts 15 and 101

²¹⁸ See 47 U.S.C. § 160(a)(2).

²¹⁹ See 47 U.S.C. § 160(a)(3).

²²⁰ *NPRM*, 17 FCC Rcd at 12,218 ¶ 91.

²²¹ See 47 C.F.R. § 101.56.

²²² See 47 C.F.R. § 101.1111.

²²³ See, e.g., MAS Report and Order, FCC No. 99-415 at ¶¶ 78-88; 39 GHz MO&O, 14 FCC Rcd 12428; Revision of Part 22 and Part 90 of the Commission's Rules to Facilitate Future Development of Paging Systems, PR Docket No. 93-253, Memorandum Opinion and Order on Reconsideration and Third Report and Order, 14 FCC Rcd 10030, 10101 (1999) (Paging Systems Third Report and Order); Rulemaking to Amend Parts 1, 2, 21, and 25, of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, To Reallocate the 29.5-30.0 GHz Frequency Band, To Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services, CC Docket No. 92-297, Fourth Report and Order, 13 FCC Rcd 11655 (1998) (LMDS Fourth Report and Order); Geographic Partitioning and Spectrum Disaggregation by Commercial Mobile Radio Service Licensees, Report and Order and Further Notice of Proposed Rulemaking, WT Docket No. 96-148, 11 FCC Rcd 21,831 (1996) (Partitioning and Disaggregation Report and Order).

²²⁴ *Partitioning and Disaggregation Report and Order*, 11 FCC Rcd at 21,843 ¶ 12.

88. *Background.* The Commission has traditionally regulated fixed, point-to-point, and point-to-multipoint operations generally under Part 74 (broadcast auxiliary), Part 78 (Cable Television Relay Service (CARS)) or Part 101 (commercial and private) of the Commission's Rules.²²⁵ In the *NPRM*, the Commission noted that there are similarities between the services contemplated in the 71-76 GHz, 81-86 GHz and 92-95 GHz bands and existing Part 101 fixed microwave services such as the 39 GHz service.²²⁶ Thus, the Commission tentatively concluded that regulation under Part 101 and 15 of our Rules is appropriate for commercial use of these bands and unlicensed operations, respectively.

89. *Discussion.* All commenters who addressed this issue supported regulating these bands under Part 101 of our Rules.²²⁷ We agree for the reasons stated in the *NPRM*. Therefore, we will regulate these bands under Part 101, except for the portions of the 92-95 GHz band where non-Federal Government use is secondary and where unlicensed devices will be regulated under Part 15 of our rules.

2. Technical Rules

90. *Interference Protection Criteria. Background.* In the *NPRM*, we proposed to allow licensees to resolve their coordination problems with as little input from the Commission as possible.²²⁸ In addition, to the extent we decided to use registration, we asked for comments on whether any of the criteria in Section 101.105 of our Rules could be applied to these bands.²²⁹ Loea suggested that Part 101.111 provided appropriate emission limitations to protect adjacent bands from harmful interference.²³⁰ Similarly, the Joint Parties, Cisco (with modification), and WCAI supported the use of Part 101.111 for the 71-76 and 81-86 GHz bands.²³¹

91. *Discussion.* The record gives ample support for the use generally of Part 101 in these bands to curtail possible harmful interference. With respect to the interference protection, the Above 60 GHz Committee of the WCAI (Above 60 Committee) proposed that we protect a desired to undesired ratio (D/U) of up to 36 dB in these bands.²³² While at lower microwave bands a fading factor is often added to a theoretical D/U ratio to yield much higher protection goals,²³³ "rain fading will be highly correlated in

²²⁵ As noted below, we are authorizing only point-to-point operations, and not point-to-multipoint operations.

²²⁶ *NPRM*, 17 FCC Rcd at 12,219 ¶ 93.

²²⁷ Cisco Reply at 9; Loea Comments at 31; Loea Reply at 18; NAS Comments at 9; NTIA Reply at 13; WCAI Comments at 23, 26.

²²⁸ *NPRM*, 17 FCC Rcd at 12,220 ¶ 98.

²²⁹ *Id.*

²³⁰ Loea Comments at 15.

²³¹ Joint Parties Reply at 6; Cisco Comment at 32; WCAI Comments at 23.

²³² See, e.g., Letter from Andrew Kreig, President Wireless Communications Association, International, to Marlene Dortch, Esq., Secretary, Federal Communications Commission 2-3 (September 30, 2003) (*WCAI Letter*).

²³³ See *Interference Criteria for Microwave Systems*, TSB-1F, Telecommunications Industry Association, 1994

these frequencies”²³⁴ so the 36 dB protection ratio should be sufficient in these bands for licensees employing digital modulation. The Above 60 Committee also proposed that we adopt an interference threshold-to-interference (T/I) ratio that would cause no more than 1.0 dB of degradation to the static threshold of a protected receiver. We believe that the combination of these two standards will adequately protect both digital and analog systems. Therefore, we will adopt 36 dB as the minimum D/U ratio for protection of prior-filed or existing facilities and a T/I ratio of 1.0 dB.

92. We also seek to limit the out of band emissions using the existing formula in 101.111(a)(2)(ii) applied at the edge of the bandwidth in use. However, we need to specify a maximum value for B in the chart in Section 101.109 to be used in the equation no matter what the actual bandwidth in use. We will adapt Section 101.111(a)(2)(iv) which applies from 24 GHz to 70-90 GHz to achieve the desired result. Therefore, the emission mask for 70, 80, and 90 GHz shall apply only at the edge of each bandwidth used, and not to subchannels established by licenses within the bandwidth in use (1.25, 3.75 etc, up the maximum 12.9 GHz). A carrier of the subchannels can be located sufficiently far from the channel edges so that the emission levels of the mask can be satisfied. The value of B (bandwidth) for all cases shall be 500 MHz and the mean output power used in the calculation is the sum of the output power of a fully populated channel.²³⁵ These criteria will govern interference protection between non-Federal Government stations. NTIA will determine, within its discretion, whether to use the same standards for its coordination for non-Federal Government to non-Federal Government coordination.

93. *Frequency Tolerance. Background.* In the *NPRM* we proposed to apply our Part 101 rules to govern the use of new services in the 71-76, 81-86 and 92-95 GHz bands. We solicited comment on all technical parameters that should apply to operations at 71-76, 81-86 and 92-95 GHz, and specifically suggested a 0.03 % frequency tolerance specification. Loea, based on its perception that the complete 5 GHz segment in each of the 71-76 GHz and 81-86 GHz bands should be authorized, opposed any specification for frequency tolerance in these bands.²³⁶ Similarly, Cisco argued against specifying any frequency tolerance.²³⁷ The FWCC, on the contrary, supported a 0.03% frequency tolerance specification.²³⁸

94. *Discussion.* The record indicates that a wide range of uses are anticipated for these bands. For example, a number of commenters stated that the 71-76 GHz and 81-86 GHz bands will be used to provide high capacity data transmission services.²³⁹ In order to accommodate these varied services, and to provide licensees the necessary technical flexibility to meet demands, we believe that any benefits to be gained by adopting the proposed 0.03% frequency stability specification will be outweighed by the limits it will place on the early development of these bands, particularly in light of other interference safeguards in our rules.²⁴⁰

²³⁴ See *WCAI Letter* at 2.

²³⁵ The equation: $A = 11 + 0.4(P - 50) + 10 \text{ Log } B$, where A is the attenuation below the mean output power level, P = the percent removed from the carrier frequency, and B= the authorized bandwidth in megahertz, would yield an attenuation of 38 dB for P=50% and B=500 at the channel edge. This is the same value used for MVDDS.

²³⁶ Loea Comments at 35.

²³⁷ Cisco Comments at 32.

²³⁸ FWCC Comments at 12.

²³⁹ See, e.g., IBG Comments at 1; Cisco Comments at 6; KCC Inc. Comments at 1; Wi-Fi Alliance Comments at 2.

²⁴⁰ See 47 C.F.R. §§ 101.105 and 101.111.

Our basis for this view stems from our desire to provide licensees flexibility in the range of services provided, and to avoid imposing unnecessary regulations. In addition, we believe such a standard could inhibit technological advances. The concerns that elimination of this standard may lead to inter-system interference are addressed by our existing out of band emission requirements (emission mask) contained in Sections 101.111 of the Commission's Rules.²⁴¹ Should this emission requirement prove inadequate for this band, we will revisit these parameters. Thus, we believe that, at present, strict adherence to Section 101.111 will be as effective in controlling harmful interference as the imposition of a frequency tolerance standard. We believe that this action should provide the flexibility necessary for manufacturers to develop equipment in the 71-76 GHz, 81-86 GHz and 92-95 GHz bands. Furthermore, we find this action to be consistent with that taken for the 39 GHz band on the frequency tolerance issue.²⁴²

95. *Restrictions on Total Radiated Power and Antenna Directionality. Background.* In the *NPRM* we requested comment on whether there was a need for EIRP limits in the 71-76 GHz, 81-86 GHz and 92-95 GHz bands.²⁴³ Loea proposed to adopt a maximum EIRP of +55 dBW, based on Dr. Lovberg's paper,²⁴⁴ which concluded that this EIRP is high enough to allow broadband communications at 99.999% availability, yet not so high as to cause undue interference.²⁴⁵ Loea also requested that the Commission specify a minimum 50 dBi gain and a 0.6 degree half-power beamwidth for the antennas used in the 71-76 and 81-86 GHz bands, based on Dr. Lovberg's paper and WCAI's support for these parameters.²⁴⁶ WCAI proposed standards for antenna gain and directionality along with a radiation pattern table for Standard A and Standard B antennas.²⁴⁷ This proposal allowed for Standard B antennas which would have a gain less than 50 dB and a proportional reduction in power relative to the reduction in gain. Similar standards and antenna gain and directionality tables were given by the Joint Parties.²⁴⁸ Endwave requested a higher limit on EIRP of 65 dBW, with suitable limits on antenna gain, indicating that such level is required to meet the needs of 10 Gbps data links with high reliability.²⁴⁹ Cisco opposed a strict definition of antenna gain and patterns, and instead identified Automatic Transmitter Power Control (ATPC) as the most essential element in controlling Total Radiated Power, based on its computer simulation results with ATPC and antenna patterns.²⁵⁰ However, Cisco's simulations also concluded that

²⁴¹ 47 C.F.R. § 101.111. The rule requires frequencies removed in various percentages from the center frequency to be attenuated below the mean power of the transmitter. This means that the frequencies at the outer edges of an assigned 1250 MHz channel or the edge of an aggregated group of 1250 MHz channels power levels will be significantly reduced such that interference to an adjacent channel licensee is unlikely.

²⁴² See *39 GHz R&O*, 12 FCC Rcd at 18,629 ¶ 59, 18,631 ¶ 63.

²⁴³ *NPRM*, 17 FCC Rcd at 12,221 ¶ 100.

²⁴⁴ Dr. John Lovberg, CTO, Loea Communications Corporation, "Specific Proposals for Technical Rules Governing the 71-76,81436, and 92-95 GHz Bands," (filed Dec. 18, 2002) (Lovberg Paper) (discusses the standards proposed by the WCAI Over 40 GHz Committee).

²⁴⁵ Loea Comments at 36; Lovberg Paper at 4.

²⁴⁶ *Id.*

²⁴⁷ WCAI Comments at 27-28.

²⁴⁸ Joint Parties Reply Comments at 6-8.

²⁴⁹ Endwave Comments at 5.

²⁵⁰ Cisco Comments at 26-27.

side-lobe and back-lobe performance on antennas were as important as the antenna's half-power beamwidths,²⁵¹ which indicates that in heavy rain, ATPC might be less effective in avoiding harmful interference than a well-designed antenna pattern.

96. *Discussion.* We are persuaded that in order to realize the overall ubiquity of spectrum use invoked by the "pencil beam" concept, the highest attention must be given to the overall antenna radiation pattern and ATPC. We concur with Loea, that, under heavy rain circumstances, neighboring links would be using the maximum power triggered by the ATPC, and the antenna pattern might not give enough attenuation to avoid inter-system interference.²⁵² We are not persuaded by commenters who seek to require ATPC, because we are in the early stages of development of equipment for these bands, and we believe that manufacturers would benefit more from relaxation of the transmitter equipment specifications than from relaxation in the antenna requirements. Thus, we believe that users need not bear the additional cost of ATPC. In fact, we can see more benefits from allowing more flexibility in the manufacturing of the transceivers, which contain more expensive hardware, than in the manufacturing of the antennas. We foresee that legacy antennas with undesirable radiation patterns that would be approved today could pose serious obstacles to the growth of microwave links in these bands in highly populated urban areas in the future. We agree with Loea's antenna pattern proposal of 50 dBi and 0.6 degree half-power beamwidth, which was supported by most commenters. Therefore, we will modify the table in Section 101.115 of our rules to require that the minimum antenna gain shall be 50 dBi and the maximum beamwidth to 3 dB points shall be 0.6 degrees. We also agree with WCAI's proposal for technical parameters for Standard A antennas because we seek to maximize the efficiency and use of this spectrum. However, we do not agree with adopting parameters for antennas which would have a gain of less than 50 dB. Therefore, we do not adopt WCAI's technical parameters for Standard B antennas. Accordingly, we will authorize only one standard antenna.

97. In the *NPRM*,²⁵³ the Commission proposed to make the 92-95 GHz band available for unlicensed use and set forth proposed rules²⁵⁴ that are based on existing regulations for the 57-64 GHz band.²⁵⁵ It suggested that power levels for 57-64 GHz unlicensed operation are also appropriate for 92-95 GHz. We here create a new Section 15.257 that is based on Section 15.255 for 57-64 GHz, but reflects our limitation of unlicensed devices to indoor use.²⁵⁶

98. *RF Safety. Background.* In the *NPRM*, the Commission proposed that licensees and manufacturers be subject to the RF radiation exposure requirements specified in Sections 1.1307(b), 2.1091 and 2.1093 of our Rules.²⁵⁷ The Commission also asked for comments on requiring routine environmental evaluations for RF exposure in the case of fixed operations, including base stations, in

²⁵¹ *Id.* at 27.

²⁵² Loea Comments at 42 (Dr. Lovberg's paper at 12).

²⁵³ *NPRM*, 17 FCC Rcd at 12,205 ¶ 62.

²⁵⁴ *Id.* at 12,237 (Appendix B).

²⁵⁵ 47 C.F.R. § 15.255.

²⁵⁶ *See* para. 40 *supra*; Final Rules, Appendix B, Section 15.257.

²⁵⁷ *NPRM*, 17 FCC Rcd at 12,222 ¶ 102.

cases where there is a possible safety risk if the installation of the transmitter antenna is not properly designed.²⁵⁸

99. *Discussion.* The record does not provide detailed comments concerning the issue of RF safety. WCAI, Harris and Loea agreed with the Commission's exposure requirements in the *NPRM*, explaining that such requirements would give adequate protection to the public.²⁵⁹ NRAO indicated the Commission has transferred the free space loss calculation results from the 57-64 GHz band to the higher frequencies considered in the *NPRM*.²⁶⁰ NRAO contends that the atmosphere is *significantly* more transparent at these higher frequencies, and therefore more conservative calculations should be made when attempting to predict safety exposures and potential for harmful interference.²⁶¹ On June 26, 2003, the Commission issued a *Notice of Proposed Rule Making* which would update exposure limit requirements.²⁶² Therefore, we conclude that the existing exposure requirements found in Sections 1.1307(b), 2.1091 and 2.1093 of our Rules are sufficient, pending the result of that proceeding.

F. PROCEDURAL MATTERS

1. Final Regulatory Flexibility Analysis

100. A Final Regulatory Flexibility Analysis has been prepared for the *Report and Order* and is included in Appendix A.

2. Paperwork Reduction Analysis

101. This *Report and Order* contains either a new or modified information collection. As part of the Commission's continuing effort to reduce paperwork burdens, we invite the general public and the Office of Management and Budget (OMB) to take this opportunity to comment on revision to the information collections contained in the *Report and Order* as required by the Paperwork Reduction Act of 1995.²⁶³ Public and agency comments are due **[60 days after date of publication in the Federal Register]**. Comments should address:

- Whether the proposed collection of information is necessary for the proper performance of the functions of the Commission, including whether the information shall have practical utility.
- The accuracy of the Commission's burden estimates.
- Ways to enhance the quality, utility, and clarity of the information collected.

²⁵⁸ *Id.*

²⁵⁹ WCAI Comments at 29; Loea Comments at 36; Harris Comments at 14.

²⁶⁰ NRAO Comments at 2.

²⁶¹ *Id.*

²⁶² Proposed Changes in the Commission's Rules Regarding Human Exposure to Radiofrequency Electromagnetic Fields, *Notice of Proposed Rule Making*, ET Docket No. 03-137, 18 FCC Rcd 14,708 (2003).

²⁶³ *See* Pub. L. No. 104-13.

- Ways to minimize the burden of the collection of information on the respondents, including the use of automated collection techniques or other forms of information technology.

102. Written comments by the public on the proposed and/or modified information collections are due 60 days after the date of publication in the *Federal Register*. Written comments must be submitted by the OMB on the proposed and/or modified information collections on or before 120 days after the date of publication in the *Federal Register*. In addition to filing comments with the Secretary, a copy of any comments on the information collections contained herein should be submitted to Judith B. Herman, Federal Communications Commission, Room 1-C804, 445 12th Street, SW, Washington, DC 20554, or via the Internet to jboley@fcc.gov, and to Kim A. Johnson, OMB Desk Officer, Room 10236 New Executive Office Building, 725 Seventeenth Street, N. W., Washington, D.C. 20503, or via the Internet to Kim.A.Johnson@omb.eop.gov. For additional information concerning the information collection(s) contained in this document, contact Judith B. Herman at 202-418-0214, or via the Internet at jboley@fcc.gov.

3. Further Information

103. For further information concerning the *Report and Order*, contact Jennifer Burton regarding legal matters, and/or Gerardo Mejia regarding engineering matters via phone at (202) 418-0680, via TTY (202) 418-7233, via e-mail at Jennifer.Burton@fcc.gov; Gerardo.Mejia@fcc.gov, respectively, or via regular mail at Federal Communications Commission, Wireless Telecommunications Bureau, 445 12th Street, SW, Washington, D.C. 20554.

104. Alternative formats (computer diskette, large print, audio cassette, and Braille) are available to persons with disabilities by contacting Brian Millin at (202) 418-7426, TTY (202) 418-7365, or via e-mail to bmillin@fcc.gov. This *Report and Order* can be downloaded from the Commission's website at www.fcc.gov/wtb/orders.

G. ORDERING CLAUSES

105. ACCORDINGLY, IT IS ORDERED that, pursuant to Sections 1, 4(i), 301, 302, 303(f) and (r), 309(j) and 332 of the Communications Act of 1934, as amended, 47 U.S.C. 1, 154(i), 301, 302, 303(f) and (r), 309(j) and 332, this *Report and Order* is ADOPTED.

106. IT IS FURTHER ORDERED that the Commission's Consumer Information and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this *Report and Order*, including the Final Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary

APPENDIX A: FINAL REGULATORY FLEXIBILITY ANALYSIS

As required by the Regulatory Flexibility Act of 1980, as amended (RFA),²⁶⁴ an Initial Regulatory Flexibility Analysis (IRFA) was incorporated in the *Notice of Proposed Rule Making (NPRM)* in this proceeding in WT Docket No. 02-146. The Commission sought public comment on the proposals in the *NPRM*, including on the IRFA. This present Final Regulatory Flexibility Analysis (FRFA) conforms to the RFA.

A. Need for, and Purpose of this Action

In this *Report and Order*, we adopt rules for the licensing and operation of the 71-76 GHz, 81-86 GHz and 92-95 GHz (70-80-90 GHz) spectrum bands. Currently, there are no rules in place for these bands. The rules we adopt implement non-exclusive, nationwide licensing with site-by-site registration for these bands. We believe that this approach will also stimulate investment in new technologies, provide a critical means of achieving greater spectrum efficiency and promote research and development.

B. Issues Raised in Response to the IRFA

No comments were filed in response to the IRFA.

C. Description and Estimate of the Small Entities to Which Rules Will Apply

The Commission will apply the definition of small entities developed for licensees in the 39 GHz band to licensees in the 70-80-90 GHz bands, as follows:

The SBA has developed a small business size standard for Cellular and Other Wireless telecommunication, which consists of all such firms having 1,500 or fewer employees.²⁶⁵ According to Census Bureau data for 1997, in this category there was a total of 977 firms that operated for the entire year.²⁶⁶ Of this total, 965 firms had employment of 999 or fewer employees, and an additional twelve firms had employment of 1,000 employees or more.²⁶⁷ Thus, under this size standard, the majority of firms can be considered small.

The applicable definition of small entity is the definition under the SBA rules applicable to manufacturers of “Radio and Television Broadcasting and Communications Equipment.” According to the SBA’s regulation, an RF manufacturer must have 750 or fewer employees in order to qualify as a small business.²⁶⁸ Census Bureau data indicates that there are 858 companies in the United States that manufacture radio and television broadcasting and communications equipment, and that 778 of these

²⁶⁴ See 5 U.S.C. § 603. The RFA, see 5 U.S.C. § 601-612, has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Pub. L. No. 104-121, Title II, 110 Stat. 847 (1996).

²⁶⁵ 13 C.F.R. § 121.201, NAICS code 517212 (changed from 513322 in October 2002).

²⁶⁶ U.S. Census Bureau, 1997 Economic Census, Subject Series: Information, “Establishment and Firm Size (Including Legal Form of Organization),” Table 5.

²⁶⁷ *Id.* The census data do not provide a more precise estimate of the number of firms that have 1,500 or fewer employees; the largest category provided is “Firms with 1,000 employees or more.”

²⁶⁸ See 13 C.F.R. § 121.201, NAICS Code 334220.

firms have fewer than 750 employees and would be classified as small entities.²⁶⁹ Therefore, we believe that no more than 778 of the companies that manufacture RF equipment qualify as small entities.

D. Description of the Projected Reporting, Recordkeeping, and Other Compliance Requirements

This *Report and Order* modifies the reporting, recordkeeping or other compliance requirements previously proposed in this proceeding. All applicants who are approved will each be granted a single, non-exclusive nationwide license. There is no limit to the number of non-exclusive nationwide licenses that may be granted for these bands, and these licenses will serve as a prerequisite for registering individual links. At the outset, we will continue to coordinate each link under our existing coordination process, which is set forth in section 101.103 of our Rules. Each link must be registered in the Commission's ULS and also requires IRAC coordination. On a going-forward basis, we are working cooperatively with NTIA to facilitate an innovative, streamlined link registration process that will enable licensees to expedite service to the public. The licensing and registration process is the same for all interested parties.

E. Steps Taken to Minimize Significant Economic Impact on Small Entities, and Significant Alternatives Considered

The required single, non-exclusive nationwide license with site-based registration serves the public interest by simplifying the licensing process and enabling all who are interested to obtain a license to provide service where their targeted market is located. There is no limit to the number of non-exclusive nationwide licenses that may be granted for these bands, so all who qualify as licensees will receive a license. This licensing scheme will allow small businesses the flexibility to provide a variety of services in their chosen markets, because links may be registered anywhere in the United States.

F. Federal Rules That Overlap, Duplicate, or Conflict with These Proposed Rules

None.

G. Report to Congress:

The Commission will send a copy of this *Report and Order*, including this FRFA, in a report to be sent to Congress pursuant to the Congressional Review Act.²⁷⁰ In addition, the Commission will send a copy of this *Report and Order*, including the FRFA, to the Chief Counsel for Advocacy of the Small Business Administration. A copy of this *Report and Order* and FRFA (or summaries thereof) will also be published in the *Federal Register*.²⁷¹

²⁶⁹ See U.S. Department of Commerce, 1992 Census of Transportation, Communications and Utilities (issued May 1995), NAICS category 334220.

²⁷⁰ See 5 U.S.C. § 801(a)(1)(A).

²⁷¹ See 5 U.S.C. § 604(b).

APPENDIX B: FINAL RULES

1. For the reasons discussed in the preamble, the Federal Communications Commission amends 47 CFR Parts 1, 2, 15, 97, and 101 as follows:

PART 1 – PRACTICE AND PROCEDURE

2. The authority citation for Part 1 continues to read as follows:

Authority: 47 U.S.C. 151, 154(i), 154(j), 155, 225, 303(r), 309 and 325(e).

3. Section 1.1307(b)(1) is amended by adding entries to the end of Table 1 as follows:

§ 1.1307 Actions that may have a significant environmental effect, for which Environmental Assessments (EAs) must be prepared.

(a) * * * * *

(b) (1) * * * * *

Service (title 47 CFR rule part)	Evaluation required if:
*	*****
70/80/90 GHz Bands (subpart Q of part 101)	Non-building-mounted antennas: height above ground level to lowest point of antenna < 10 m and power > 1640 W EIRP Building-mounted antennas: power > 1640 W EIRP, licensees are required to attach a label to transceiver antennas that (1) provides adequate notice regarding potential radiofrequency safety hazards, e. g., information regarding the safe minimum separation distance required between users and transceiver antennas; and (2) references the applicable FCC-adopted limits for radio-frequency exposure specified in §1.1310.

PART 2 -- FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS

4. The authority citation for part 2 continues to read as follows:

Authority: 47 U.S.C. 154, 302a, 303, and 336, unless otherwise noted.

5. Section 2.106, the Table of Frequency Allocations, is amended as follows:

a. Revise pages 81 through 83.

b. In the list of United States (US) Footnotes, revise footnotes US211, US297, and US342; remove footnotes US270 and US377; and add footnotes US387, US388, and US389.

The additions and revisions read as follows:

§ 2.106 Table of Frequency Allocations.

* * * * *

International Table			United States Table		FCC Rule Part(s)
Region 1	Region 2	Region 3	Federal Government	Non-Federal Government	
65-66 EARTH EXPLORATION-SATELLITE FIXED INTER-SATELLITE MOBILE except aeronautical mobile SPACE RESEARCH			65-66 EARTH EXPLORATION- SATELLITE FIXED MOBILE except aeronautical mobile SPACE RESEARCH	65-66 EARTH EXPLORATION- SATELLITE FIXED INTER-SATELLITE MOBILE except aeronautical mobile SPACE RESEARCH	
5.547					
66-71 INTER-SATELLITE MOBILE 5.553 5.558 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE			66-71 MOBILE 5.553 5.558 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION- SATELLITE	66-71 INTER-SATELLITE MOBILE 5.553 5.558 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION- SATELLITE	
5.554			5.554	5.554	
71-74 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE MOBILE-SATELLITE (space-to-Earth)			71-74 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE MOBILE-SATELLITE (space-to-Earth) US389		Fixed Microwave (101)
74-76 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE BROADCASTING BROADCASTING-SATELLITE Space research (space-to-Earth)			74-76 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE Space research (space-to-Earth)	74-76 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE BROADCASTING BROADCASTING- SATELLITE Space research (space-to-Earth)	
5.559A 5.561			US387 US389	US387 US389	
76-77.5 RADIO ASTRONOMY RADIOLOCATION Amateur Amateur-satellite Space research (space-to-Earth)			76-81 RADIOLOCATION	76-77 RADIOLOCATION Amateur	RF Devices (15)
5.149				77-77.5 RADIOLOCATION Amateur Amateur-satellite	Amateur (97)

77.5-78 AMATEUR AMATEUR-SATELLITE Radio astronomy Space research (space-to-Earth) 5.149		77.5-78 RADIOLOCATION AMATEUR AMATEUR-SATELLITE	
78-79 RADIOLOCATION Amateur Amateur-satellite Radio astronomy Space research (space-to-Earth) 5.149 5.560		78-81 RADIOLOCATION Amateur Amateur-satellite	
79-81 RADIO ASTRONOMY RADIOLOCATION Amateur Amateur-satellite Space research (space-to-Earth) 5.149	5.560	5.560	
81-84 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE MOBILE-SATELLITE (Earth-to-space) RADIO ASTRONOMY Space research (space-to-Earth) 5.149 5.561A	81-84 FIXED FIXED-SATELLITE (Earth-to-space) US297 MOBILE MOBILE-SATELLITE (Earth-to-space) RADIO ASTRONOMY Space research (space-to-Earth) US342 US388 US389		Fixed Microwave (101)
84-86 FIXED FIXED SATELLITE (Earth-to-space) 5.561B MOBILE RADIO ASTRONOMY 5.149	84-86 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE RADIO ASTRONOMY US342 US388 US389		
86-92 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340	86-92 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY US74 SPACE RESEARCH (passive) US246		

International Table			United States Table		FCC Rule Part(s)
Region 1	Region 2	Region 3	Federal Government	Non-Federal Government	
92-94 FIXED MOBILE RADIO ASTRONOMY RADIOLOCATION 5.149			92-94 FIXED MOBILE RADIO ASTRONOMY RADIOLOCATION US342 US388		RF Devices (15) Fixed Microwave (101)
94-94.1 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active) Radio astronomy 5.562 5.562A			94-94.1 EARTH EXPLORATION- SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active) Radio astronomy 5.562 5.562A	94-94.1 RADIOLOCATION Radio astronomy 5.562A	RF Devices (15)
94.1-95 FIXED MOBILE RADIO ASTRONOMY RADIOLOCATION 5.149			94.1-95 FIXED MOBILE RADIO ASTRONOMY RADIOLOCATION US342 US388		RF Devices (15) Fixed Microwave (101)
95-100 FIXED MOBILE RADIO ASTRONOMY RADIOLOCATION RADIONAVIGATION RADIONAVIGATION-SATELLITE 5.149 5.554			95-100 MOBILE US376 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE Radiolocation 5.149 5.554		
100-102 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 5.341			100-102 EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) 5.341 US246		
102-105 FIXED MOBILE RADIO ASTRONOMY 5.149 5.341			102-105 FIXED FIXED-SATELLITE (space-to-Earth) 5.341 US211		

* * * * *

UNITED STATES (US) FOOTNOTES

* * * * *

US211 In the bands 1670-1690, 5000-5250 MHz and 10.7-11.7, 15.1365-15.35, 15.4-15.7, 22.5-22.55, 24-24.05, 31.0-31.3, 31.8-32.0, 40.5-42.5, 102-105, 116-126, 151-164, 176.5-182, 185-190, 231-235, 252-265 GHz, applicants for airborne or space station assignments are urged to take all practicable steps to protect radio astronomy observations in the adjacent bands from harmful interference; however, US74 applies.

* * * * *

US297 The bands 47.2-49.2 GHz and 81-82.5 GHz are also available for feeder links for the broadcasting-satellite service.

* * * * *

US342 In making assignments to stations of other services to which the following bands:

13360-13410 kHz	22.81-22.86 GHz*	150-151 GHz*
25550-25670 kHz	23.07-23.12 GHz*	174.42-175.02 GHz*
37.5-38.25 MHz	31.2-31.3 GHz	177-177.4 GHz*
322-328.6 MHz*	36.43-36.5 GHz*	178.2-178.6 GHz*
1330-1400 MHz*	42.5-43.5 GHz	181-181.46 GHz*
1610.6-1613.8 MHz*	48.94-49.04 GHz*	186.2-186.6 GHz*
1660-1670 MHz	81-86 GHz	250-251 GHz*
3260-3267 MHz*	92-94 GHz	257.5-258 GHz*
3332-3339 MHz*	94.1-95 GHz	261-265 GHz
3345.8-3352.5 MHz*	97.88-98.08 GHz*	262.24-262.76 GHz*
4825-4835 MHz*	140.69-140.98 GHz*	265-275 GHz
14.47-14.5 GHz*	144.68-144.98 GHz*	265.64-266.16 GHz*
22.01-22.21 GHz*	145.45-145.75 GHz*	267.34-267.86 GHz*
22.21-22.5 GHz	146.82-147.12 GHz*	271.74-272.26 GHz*

are allocated (* indicates radio astronomy use for spectral line observations) all practicable steps shall be taken to protect the radio astronomy service from harmful interference. Emissions from spaceborne or airborne stations can be particularly serious sources of interference to the radio astronomy service (see Nos. 4.5 and 4.6 and Article 29 of the ITU Radio Regulations).

* * * * *

US387 The band 75.5-76 GHz is also allocated to the amateur and amateur-satellite services on a secondary basis until January 1, 2006. After that date, the band 75.5-76 GHz shall no longer be available for use by the amateur service or the amateur-satellite service.

US388 In the bands 81-86 GHz, 92-94 GHz, and 94.1-95 GHz and within the coordination distances indicated below, assignments to allocated services shall be coordinated with the following radio astronomy observatories. New observatories shall not receive protection from fixed stations that are licensed to operate in the one hundred most populous urbanized areas as defined by the U.S. Census Bureau for the year 2000. The coordinates listed below are specified in terms of the North American Datum of 1983.

Note: Satisfactory completion of the coordination procedure utilizing the automated mechanism, see §101.1523, will be deemed to establish sufficient separation from radio astronomy observatories, regardless of whether the distances set forth above are met.

Telescope and site	150 kilometer (93 mile) radius centered on:	
	North Latitude	West Longitude
National Radio Astronomy Observatory (NRAO), Robert C. Byrd Telescope, Green Bank, WV	38° 25' 59"	79° 50' 24"
NRAO, Very Large Array, Socorro, NM	34° 04' 44"	107° 37' 06"
University of Arizona 12-m Telescope, Kitt Peak, AZ	31° 57' 10"	111° 36' 50"
BIMA Telescope, Hat Creek, CA	40° 49' 04"	121° 28' 24"
Caltech Telescope, Owens Valley, CA	37° 13' 54"	118° 17' 36"
Five Colleges Observatory, Amherst, MA	42° 23' 33"	72° 20' 40"
Haystack Observatory, Westford, MA	42° 37' 23"	71° 29' 19"
James Clerk Maxwell Telescope, Mauna Kea, HI	19° 49' 33"	155° 28' 20"
Combined Array for Research in Millimeter-wave Astronomy (CARMA), CA	CARMA will be located at a new, high-altitude site in eastern California, expected to be operational in 2004.	
NRAO, Very Long Baseline Array Stations	25 kilometer (15.5 mile) radius centered on:	
	North Latitude	West Longitude
Brewster, WA	48° 07' 52"	119° 41' 00"
Fort Davis, TX	30° 38' 06"	103° 56' 41"
Hancock, NH	42° 56' 01"	71° 59' 12"
Kitt Peak, AZ	31° 57' 23"	111° 36' 45"
Los Alamos, NM	35° 46' 31"	106° 14' 44"
Mauna Kea, HI	19° 48' 05"	155° 27' 19"
North Liberty, IA	41° 46' 17"	91° 34' 27"
Owens Valley, CA	37° 13' 54"	118° 16' 37"
Pie Town, NM	34° 18' 04"	108° 07' 09"
Saint Croix, VI	17° 45' 24"	64° 35' 01"

US389 In the bands 71-76 GHz and 81-86 GHz, stations in the fixed, mobile, and broadcasting services shall not cause harmful interference to, nor claim protection from, Federal Government stations in the fixed-satellite service at any of the following 28 military installations:

Military Installation	State	Nearby city
Redstone Arsenal.....	AL	Huntsville
Fort Huachuca.....	AZ	Sierra Vista
Yuma Proving Ground.....	AZ	Yuma
Beale AFB.....	CA	Marysville
Camp Parks Reserve Forces Training Area.....	CA	Dublin
China Lake Naval Air Weapons Station.....	CA	Ridgecrest
Edwards AFB.....	CA	Rosamond
Fort Irwin.....	CA	Barstow
Marine Corps Air Ground Combat Center.....	CA	Twentynine Palms
Buckley AFB.....	CO	Aurora (Denver)
Schriever AFB.....	CO	Colorado Springs
Fort Gordon.....	GA	Augusta
Naval Satellite Operations Center.....	GU	Finegayan (Territory of Guam)
Naval Computer and Telecommunications Area Master Station, Pacific.....	HI	Wahiawa (Oahu Is.)
Fort Detrick.....	MD	Frederick
Nellis AFB.....	NV	Las Vegas
Nevada Test Site.....	NV	Amargosa Valley
Tonapah Test Range Airfield.....	NV	Tonapah
Cannon AFB.....	NM	Clovis
White Sands Missile Range.....	NM	White Sands
Dyess AFB.....	TX	Abilene
Fort Bliss.....	TX	El Paso
Fort Sam Houston.....	TX	San Antonio
Goodfellow AFB.....	TX	San Angelo
Kelly AFB.....	TX	San Antonio
Utah Test and Training Range.....	UT	.....
Fort Belvoir.....	VA	Alexandria
Naval Satellite Operations Center.....	VA	Chesapeake

* * * * *

4. Section 2.1091 is revised by amending paragraph (c) to read as follows:

§ 2.1091 Radiofrequency radiation exposure evaluation: mobile devices.

* * * * *

(c) Mobile devices that operate in the Cellular Radiotelephone Service, the Personal Communications Services, the Satellite Communications Services, the General Wireless Communications Service, the Wireless Communications Service, the Maritime Services and the Specialized Mobile Radio Service authorized under subpart H of part 22 of this chapter, part 24 of this chapter, part 25 of this chapter, part 26 of this chapter, part 27 of this chapter, part 80 of this chapter (ship earth stations devices only) and part 90 of this chapter are subject to routine environmental evaluation for RF exposure prior to equipment authorization or use if they operate at frequencies of 1.5 GHz or below and their effective radiated power (ERP) is 1.5 watts or more, or if they operate at frequencies above 1.5 GHz and their ERP

is 3 watts or more. Unlicensed personal communications service devices, unlicensed millimeter wave devices and unlicensed NII devices authorized under §§ 15.253, 15.255, and 15.257, and subparts D and E of part 15 of this chapter are also subject to routine environmental evaluation for RF exposure prior to equipment authorization or use if their ERP is 3 watts or more or if they meet the definition of a portable device as specified in § 2.1093 (b) requiring evaluation under the provisions of that section. All other mobile and unlicensed transmitting devices are categorically excluded from routine environmental evaluation for RF exposure prior to equipment authorization or use, except as specified in §§ 1.1307(c) and 1.1307(d) of this chapter. Applications for equipment authorization of mobile and unlicensed transmitting devices subject to routine environmental evaluation must contain a statement confirming compliance with the limits specified in paragraph (d) of this section as part of their application. Technical information showing the basis for this statement must be submitted to the Commission upon request.

* * * * *

5. Section 2.1093 is revised by amending paragraph (c) to read as follows:

§ 2.1093 Radiofrequency radiation exposure evaluation: portable devices.

* * * * *

(c) Portable devices that operate in the Cellular Radiotelephone Service, the Personal Communications Service (PCS), the Satellite Communications Services, the General Wireless Communications Service, the Wireless Communications Service, the Maritime Services, the Specialized Mobile Radio Service, the 4.9 GHz Band Service, the Wireless Medical Telemetry Service (WMTS) and the Medical Implant Communications Service (MICS), authorized under subpart H of part 22 of this chapter, parts 24, 25, 26, 27, 80, 90, subparts H and I of part 95 of this chapter, and unlicensed personal communication service, unlicensed NII devices and millimeter wave devices authorized under subparts D and E, § 15.253, § 15.255 and § 15.257 of part 15 of this chapter are subject to routine environmental evaluation for RF exposure prior to equipment authorization or use. All other portable transmitting devices are categorically excluded from routine environmental evaluation for RF exposure prior to equipment authorization or use, except as specified in §§ 1.1307(c) and 1.1307(d) of this chapter. Applications for equipment authorization of portable transmitting devices subject to routine environmental evaluation must contain a statement confirming compliance with the limits specified in paragraph (d) of this section as part of their application. Technical information showing the basis for this statement must be submitted to the Commission upon request.

* * * * *

PART 15 – RADIO FREQUENCY DEVICES

6. The authority citation continues to read as follows:

Authority: 47 U.S.C. 154, 302, 303, 304, 307, 336 and 544A

7. Section 15.205 is revised by amending paragraph (d)(4) to read as follows:

§ 15.205 Restricted bands of operation.

* * * * *

(d) * * *

* * * * *

- (4) Any equipment operated under the provisions § 15.253, § 15.255 or § 15.257.

* * * * *

8. Section 15.215 is revised by amending paragraphs (a) and (c) to read as follows:

§ 15.215 Additional provisions to the general radiated emission limitations.

(a) The regulations in §§ 15.217 through 15.257 provide alternatives to the general radiated emission limits for intentional radiators operating in specified frequency bands. Unless otherwise stated, there are no restrictions as to the types of operation permitted under these sections.

* * * * *

(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the 20 dB bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

9. Section 15.257 is added to Subpart C to read as follows:

§ 15.257 Operation within the band 92-95 GHz.

(a) Operation of devices under the provisions of this section is limited to indoor use;

(1) Devices operating under the provisions of this section, by the nature of their design, must be capable of operation only indoors. The necessity to operate with a fixed indoor infrastructure, e.g., a transmitter that must be connected to the AC power lines, may be considered sufficient to demonstrate this.

(2) The use of outdoor mounted antennas, e.g., antennas mounted on the outside of a building or on a telephone pole, or any other outdoors infrastructure is prohibited.

(3) The emissions from equipment operated under this section shall not be intentionally directed outside of the building in which the equipment is located, such as through a window or a doorway.

(4) Devices operating under the provisions of this section shall bear the following or similar statement in a conspicuous location on the device or in the instruction manual supplied with the device:

“This equipment may only be operated indoors. Operation outdoors is in violation of 47 U.S.C. 301 and could subject the operator to serious legal penalties.”

(b) Operation under the provisions of this section is not permitted on aircraft or satellites.

(c) Within the 92-95 GHz bands, the emission levels shall not exceed the following:

(1) The average power density of any emission, measured during the transmit interval, shall not exceed 9 uW/sq. cm, as measured at 3 meters from the radiating structure, and the peak power density of any emission shall not exceed 18 uW/sq. cm, as measured 3 meters from the radiating structure.

(2) Peak power density shall be measured with an RF detector that has a detection bandwidth that encompasses the band being used and has a video bandwidth of at least 10 MHz, or uses an equivalent measurement method.

(3) The average emission limits shall be calculated based on the measured peak levels, over the actual time period during which transmission occurs.

(d) Limits on spurious emissions:

- (1) The power density of any emissions outside the band being used shall consist solely of spurious emissions.
- (2) Radiated emissions below 40 GHz shall not exceed the general limits in § 15.209.
- (3) Between 40 GHz and 200 GHz, the level of these emissions shall not exceed 90 pW/cm² at a distance of 3 meters.
- (4) The levels of the spurious emissions shall not exceed the level of the fundamental emission.
- (e) The total peak transmitter output power shall not exceed 500 mW.
- (f) Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation. Equipment is presumed to operate over the temperature range -20 to +50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage, unless justification is presented to demonstrate otherwise.
- (g) Regardless of the maximum EIRP and maximum power density levels permitted under this section, devices operating under the provisions of this section are subject to the radiofrequency radiation exposure requirements specified in 47 C.F.R. §§ 1.1307(b), 2.1091, and 2.1093, as appropriate. Applications for equipment authorization of devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.
- (h) Any transmitter that has received the necessary FCC equipment authorization under the rules of this chapter may be mounted in a group installation for simultaneous operation with one or more other transmitter(s) that have received the necessary FCC equipment authorization, without any additional equipment authorization. However, no transmitter operating under the provisions of this section may be equipped with external phase-locking inputs that permit beam-forming arrays to be realized.

PART 97--AMATEUR RADIO SERVICE

7. The authority citation for Part 97 continues to read as follows:

Authority: 48 Stat. 1066, 1082, as amended; 47 U.S.C. 154, 303. Interpret or apply 48 Stat. 1064-1068, 1081-1105, as amended; 47 U.S.C. 151-155, 301-609, unless otherwise noted.

8. Section 97.303 is revised by adding new paragraph (r)(3) to read as follows:

§ 97.303 Frequency sharing requirements.

* * * * *

(r) * * *

* * * * *

- (3) No amateur or amateur-satellite station transmitting in the 75.5-76 GHz segment shall cause interference to, nor is protected from, interference due to the operation of stations in the fixed service. After January 1, 2006, the 75.5-76 GHz segment is no longer allocated to the amateur service or to the amateur-satellite service.

PART 101 – FIXED MICROWAVE SERVICES

9. The authority citation for Part 101 continues to read as follows:

Authority: 47 U.S.C. 154 and 303, unless otherwise noted.

10. Section 101.63 is amended by revising the paragraph to read as follows:

§ 101.63 Period of construction; certification of completion of construction.

(a) Each Station, except in Multichannel Video Distribution and Data Service, Local Multipoint Distribution Services, 24 GHz Service, and the 38.6-40.0 GHz band, authorized under this part must be in operation within 18 months from the initial date of grant.

(b) For the 70 GHz, 80 GHz, and 90 GHz bands, the 12-month construction period will commence on the date of each registration of each individual link; adding links will not change the overall renewal period of the license.

* * * * *

11. Section 101.101 is amended by adding four new entries in numerical order to read as follows:

§ 101.101 Frequency Availability.

Frequency band (MHz)	Radio Service				
	Common carrier (Part 101)	Private radio (Part 101)	Broadcast auxiliary (Part 74)	Other (Parts 15, 21, 22, 24, 25, 74, 78 & 100)	Notes
*	*	*	*	*	**
71,000-76,000	CC.....	OFS.....	.....	25	F/M/TF
81,000-86,000	CC.....	OFS.....	.....	25	F/M/TF
92,000-95,000	CC.....	OFS.....	.....	15	F/M/TF

* * * * *

12. Section 101.107(a) is amended by adding three new entries in numerical order to read as follows:

§ 101.107 Frequency tolerance.

(a) * * *

Frequency (MHz)	Frequency Tolerance (percent)		
	All fixed and base stations	Mobile stations over 3 watts	Mobile stations 3 watts or less
*	*	*	**
71,000 to 76,000 ⁹
81,000 to 86,000 ⁹
92,000 to 95,000 ⁹

* * *

⁹ Equipment authorized to be operated in the 38,600-40,000 MHz, 71,000-76,000 MHz, 81,000-86,000 MHz, 92,000-94,000 MHz and 94,100-95,000 MHz bands are exempt from the frequency tolerance requirement noted in the above table.

* * * * *

13. Section 101.109(c) is amended by removing the entry for “Above 40,000” and adding three new entries in numerical order to read as follows:

§ 101.109 Bandwidth.

(a) * * *

* * * * *

(c) * * *

Frequency band (MHz)	Maximum authorized bandwidth
* *	* * *
38,600 to 40,000.....	50 MHz ⁷
71,000 to 76,000.....	(3)
81,000 to 86,000.....	(3)
92,000 to 95,000.....	(3)

* * *

³ To be specified in authorization. For the bands of: 71 to 76 GHz, 81 to 86 GHz, and 92 to 95 GHz, maximum bandwidth is licensed in segments of 1.25 GHz for the 71-76 and 81-86 GHz bands, one segment of 2 GHz from 92-94 GHz, and one 0.9 GHz segment from 94.1 to 95 GHz, up to a total of 12.9 GHz, or the total of the loaded band if smaller than the assigned bandwidth.

* * * * *

14. Section 101.111(a)(2) is amended by adding paragraph (v) to read as follows:

§ 101.111 Emission limitations.

(a) * * *

* * * * *

(2) * * *

* * * * *

(v) The emission mask for the 71-76 GHz, 81-86 GHz, 92-94 GHz, and 94.1-95 GHz bands used in the equation in paragraph (a)(2)(ii) of this section applies only to the edge of each channel, but not to sub-channels established by licensees. The value of P in the equation is for the percentage removed from the carrier frequency and assumes that the carrier frequency is the center of the actual bandwidth used. The value of B will always be 500 MHz. In the case where a narrower sub-channel is used within the assigned bandwidth, such sub-carrier will be located sufficiently far from the channel edges to satisfy the emission levels of the mask. The mean output power used in the calculation is the sum of the output power of a fully populated channel.

* * * * *

15. Section 101.113(a) is amended by adding four entries in numerical order and by removing (DbW) and replacing it with (dBW) to read as follows:

§ 101.113 Transmitter power limitations.

(a) * * * * *

Frequency band (MHz)	Maximum Allowable EIRP ^{1 2}	
	Fixed (dBW)	Mobile (dBW)
*	*	* * *
71,000-76,000	+55	+55
81,000-86,000	+55	+55
92,000-95,000	+55	+55

* * * * *

16. Section 101.115 is amended by adding three new entries in numerical order to read as follows:

§ 101.115 Directional Antennas.

(a) * * * * *

Frequency (MHz)	Category	Maximum beam width to 3 dB points ¹ (included angle in degrees)	Minimum antenna gain (dBi)	Minimum radiation suppression to angle in degrees from centerline of main beam in decibels						
				5° to 10°	10° to 15°	15° to 20°	20° to 30°	30° to 100°	100° to 140°	140° to 180°
71,000 to 76,000	N/A	0.6	50.0	36	40	45	50	55	55	55
81,000 to 86,000	N/A	0.6	50.0	36	40	45	50	55	55	55
92,000 to 95,000	N/A	0.6	50.0	36	40	45	50	55	55	55

* * * * *

17. Section 101.147 is amended by removing the entry for “Above 40,000” and adding four new entries in numerical order in 101.147(a) and adding a new paragraph (z) to read as follows:

§ 101.147 Frequency assignments.

(a) * * *

* * * * *

- 38,600-40,000 MHz (4)
- 71,000-76,000 MHz (5) (17)
- 81,000-86,000 MHz (5) (17)
- 92,000-94,000 MHz (17)

94,100-95,000 MHz (17)

* * * * *

(z) *71,000-76,000 MHz; 81,000-86,000 MHz; 92,000-94,000 MHz; 94,100--95,000 MHz.*

(1) Those applicants who are approved in accordance with FCC Form 601 will each be granted a single, non-exclusive nationwide license. Site-by-site registration is on a first-come, first-served basis. Registration will be in the Universal Licensing System until the Wireless Telecommunications Bureau announces by public notice, the implementation of a third-party database. See 47 C.F.R. § 101.1523. The sites are currently coordinated on the basis of 47 C.F.R. § 101.103, and may not operate until NTIA approval is received. Licensees may use these bands for any point-to-point non-broadcast service.

(2) Prior links shall be protected to a threshold-to-interference ratio (T/I) level of 1.0 dB of degradation to the static threshold of the protected receiver. Any new link shall not decrease a previous link's desired-to-undesired (D/U) signal ratio below a minimum of 36 dB, unless the earlier link's licensee agrees to accept a lower D/U.

(3) Entities must meet the loading requirements of 47 C.F.R. § 101.141. If it is determined that a licensee has not met the loading requirements, then the database will be modified to limit coordination rights to the spectrum that is loaded and the licensee will lose protection rights on spectrum that has not been loaded.

18. Part 101 is amended by adding a new subpart Q to read as follows:

SUBPART Q – SERVICE AND TECHNICAL RULES FOR THE 70/80/90 GHZ BANDS

Sec.

101.1501 Services areas.

101.1505 Segmentation plan

101.1507 Permissible operations

101.1511 Regulatory status and eligibility

101.1513 License term and renewal expectancy.

101.1523 Sharing and coordination among non-Government licensees and between non-Government and Government services.

101.1525 RF safety.

101.1527 Canadian and Mexican coordination.

101.1501 Service areas.

The 70/80/90 GHz bands are licensed on the basis of non-exclusive nationwide licenses. There is no limit to the number of non-exclusive nationwide licenses that may be granted for these bands, and these licenses will serve as a prerequisite for registering individual links.

§ 101.1505 Segmentation plan.

(a) The 71-76 GHz and 81-86 GHz bands are divided into four unpaired 1.25 GHz segments each (8 total), without assignment of specific channels within the segment. An entity may request any portion of this spectrum, up to 10 GHz (1.25, 2.5, 3.75, 5, 6.25, 7.75 or 10 GHz). The segments may be aggregated without limit. Pairing is permitted, but only in a standardized manner (e.g., 71-72.25 GHz may be paired only with 81-82.25 GHz, and so on). Licensees are also permitted to register segments less than 1.25 GHz.

(b) The 92-95 GHz band is divided into three segments: 92.0-94.0 GHz and 94.1-95.0 GHz for non-Government and Government users, and 94.0-94.1 GHz for Federal Government use. Pairing is allowed and segments may be aggregated without limit. The bands in (a) above can be included for a possible 12.9 GHz maximum aggregation. Licensees are also permitted to register smaller segments than provided here.

§ 101.1507 Permissible operations.

Licensees may use the 70 GHz, 80 GHz and 90 GHz bands for any point-to-point, non-broadcast service. The segments may be unpaired or paired, but pairing will be permitted only in a standardized manner (e.g., 71-72.25 GHz may be paired only with 81-82.25 GHz, and so on). The segments may be aggregated without limit.

§ 101.1511 Regulatory status and eligibility.

(a) Licensees are permitted to provide services on a non-common carrier and/or on a common carrier basis.

(b) Licensees are subject to the requirements set forth in § 101.7.

(c) Any entity, other than one precluded by § 101.7, is eligible for authorization to provide service under this part. Authorization will be granted upon proper application filing and link coordination in accordance with the Commission's rules.

§ 101.1513 License term and renewal expectancy.

Because the licensee will obtain a single license for all of its facilities, the license renewal period will be ten years from the registration of the first link. Adding links will not change the overall renewal period of the license.

§ 101.1523 Sharing and coordination among non-Government licensees and between non-Government and Government services.

(a) Registration of each link in the 71-76 GHz, 81-86 GHz, and 92-95 GHz bands will be in the Universal Licensing System until the Wireless Telecommunications Bureau announces by public notice the implementation of a third-party database.

(b) Sharing and coordination among non-Federal Government links and between non-Federal Government and Federal Government links, shall occur according to the registration and coordination standards and procedures adopted in *Report & Order*, FCC 03-248, and as further detailed in subsequent implementation public notices issued consistent with that order. Protection of individual links against harmful interference from other links shall generally be granted to first-in-time registered links. Successful completion of coordination via the NTIA automated mechanism shall constitute successful

non-Federal Government to Federal Government coordination for that individual link.

(c) In addition, the following types of non-Federal Government links require the filing with the Commission an FCC Form 601 for each link for the purpose of coordination and registration, in addition to registering each link in the third-party database:

- (i) facilities requiring the submission of an Environmental Assessment,
- (ii) facilities requiring international coordination, and
- (iii) operation in quiet zones.

The Commission believes the licensee is in the best position to determine the nature of its operations and whether those operations impact these settings, and is required to submit to a database manager, as part of the registration package, documentation that an FCC Form 601 has been filed.

§ 101.1525 RF safety.

Licensees in the 70-80-90 GHz bands are subject to the exposure requirements found in Sections 1.1307(b), 2.1091 and 2.1093 of our Rules, and will use the parameters found therein.

§ Section 101.1527 Canadian and Mexican coordination.

(a) A licensee of bands 71.0-76.0, 81.0-86.0, 92-94 GHz and 94.1-95 GHz must comply with Section 1.928(f) of our rules, which pertains to coordination with Canada.

(b) A licensee of bands 71.0-76.0, 81.0-86.0, 92-94 GHz and 94.1-95 GHz must coordinate with Mexico in the following situations:

(1) For a station the antenna of which looks within the 200 deg. sector toward the Mexico-United States borders, that area in each country within 35 miles of the borders; and

(2) For a station the antenna of which looks within the 160 deg. sector away from the Canada-United States borders, that area in each country within 5 miles of the borders.

APPENDIX C: REQUIRED LINK DATA**A. Site Data**

1. Date
2. License Call Sign
3. Latitude (D-M-S-0.1xS)
4. Longitude (D-M-S-0.1xS)
5. Elevation (m/AMSL)
6. Path Distance (km)
7. Path Status
 1. Proposed (start date – mm/dd/yy)
 2. Active (inception date – mm/dd/yy)

B. Antenna Data

1. Transmit Antenna Type (Manufacturer/model)
2. Transmit Antenna Gain (dBi)/ Beamwidth (D)
3. Transmit Antenna Center Line (m-AGL)
4. Transmit Antenna Azimuth (D)
5. Transmit Antenna Elevation Angle (D)
6. Receive Antenna Type (Manufacturer/model)
7. Receive Antenna Gain (dBi)/ Beam-width (D)
8. Receive Antenna Center Line (m-AGL)
9. Receive Antenna Azimuth (D)
10. Receive Antenna Elevation Angle (D)

C. Equipment Data

1. Transmitter Type (Manufacturer/model)
2. Transmitter Stability (%)
3. Maximum Transmitter Output Power (dBm)
4. Transmit Frequency (MHz)
5. Transmitter Emission Bandwidth
6. Minimum Transmitter output Power (if Automatic Transmitter Power Control is employed)
7. Transmitter Station Class
8. Transmitter Emission Designator
9. Data Type (video, voice, data, other)
10. Modulation Scheme (AM, FM, OFDM, QAM, others)
11. Receiver Type (Manufacturer/model)
12. Receiver Stability (%)

APPENDIX D: LIST OF COMMENTERS**Comments:**

Boeing Company
Caltech Owens Valley Radio Observatory
Cisco Systems, Inc.
Comsearch
Electronic Data Systems
Endwave Corporation
Fixed Wireless Communications Coalition
Harris Corporation
i-Fi, LLC/BGI, Inc.
K.C.C. Inc.
Nickolaus E. Leggett
Loea Communications Corporation
National Academy of Sciences' Committee on Radio Frequencies
National Radio Astronomy Observatory
Sprint Corporation
Terabeam Corporation
Wi-Fi Alliance
Wireless Communications Association International, Inc.

Reply Comments:

Cisco Systems, Inc.
Comsearch
Harris Corporation
Loea Communications Corporation, Cisco Systems, Inc., Ceragon Networks, Endwave Corporation,
Stratex Networks, Bridgewave Communications, Inc.
Loea Communications Corporation
National Telecommunications and Information Administration
Terabeam Corporation
Winstar Communications, LLC

**SEPARATE STATEMENT OF
CHAIRMAN MICHAEL K. POWELL**

Re: Allocation and Service Rules for the 71-76 GHz, 81-86 GHz and 92-95 GHz Bands; Loea Communications Corporation Petition for Rulemaking (Report and Order; WT Doc No. 02-146; RM-10288)

Today, we open yet another new frontier in bringing the power of broadband Internet services to the American people. The spectrum bands at 71-76 GHz, 81-86 GHz, and 92-95 GHz are the highest frequency bands we have ever licensed. They join other broadband Internet platforms, both wireless—licensed, unlicensed and satellite—and wired—from powerline to DSL to cable to fiber-to-the home—in the increasingly competitive broadband Internet race.

The “millimeter wave” provides new and fertile ground for our Nation’s entrepreneurs to harvest our vision of strong facilities-based competition, vibrant innovation, lower prices and consumer protection that will define our country’s broadband Internet future. Proponents of networks in these bands say they intend to use the spectrum to compete in the market for large volume telecommunications users. Ultimately, however, the highly advanced technology used here may encourage a broad range of new products and services, such as high-speed wireless local area networks and broadband access systems for the Internet.

The innovative, first-in-time licensing scheme we adopt today creates both the opportunities and incentives necessary to put spectrum to the highest and best use for the benefit of all consumers. Our approach embraces the non-exclusive technical characteristics of the very narrow beams that transmitters in these bands produce.

We have also created a productive partnership with the National Telecommunications and Information Administration (NTIA), currently under the able leadership of Deputy Assistant Secretary and Acting Assistant Secretary Michael D. Gallagher, to make these new communications opportunities possible. NTIA’s flexibility and receptiveness to commercial use of these bands represents yet another way in which the agencies’ cooperative management of the nation’s spectrum resources encourages innovation, promotes investment and creates jobs for Americans.

**SEPARATE STATEMENT OF
COMMISSIONER MICHAEL J. COPPS**

Re: Allocation and Service Rules for the 71-76 GHz, 81-86 GHz and 92-95 GHz Bands; Loea Communications Corporation Petition for Rulemaking (Report and Order; WT Doc No. 02-146; RM-10288)

Thanks to the Bureau for bringing us this item. It's surely good news that consumers will soon be able to make use of spectrum in the 70, 80, and 90 GHz range. My hope is that this decision will promote investment and assist us in bringing new broadband service to consumers. I am also pleased that we decide to extend our use of the unlicensed spectrum concept in portions of the 90 GHz band. I believe that we should look to using the unlicensed tool even more than we do today, consistent always, of course, with whatever public interest safeguards may be necessary.

I also want to note that this spectrum is licensed in a way that will encourage companies to initiate service without the need for extensive Commission action. And our licensing scheme recognizes the unique interference characteristics of this spectrum.

Spurring the use of this new technology will hopefully, one day, allow for more choices of broadband providers than those narrow choices available to consumers and businesses today. But we should never count our chickens before they hatch. Perhaps one day we will see millimeter wave wireless broadband, along with powerline broadband and other technologies, providing real intermodal competition. I also hope that these new technologies will not be dominated by the few companies that dominate currently available broadband technologies, and that they thereby reach their competitive potential. But until that wonderful day arrives, I hope that the Commission will not mistake the promise of future competition with the reality of today's limited competition when we make policy.

So I congratulate the Wireless Bureau for this item, and I'm eager to see the great things that this band brings us.

**SEPARATE STATEMENT OF
COMMISSIONER KEVIN J. MARTIN**

Re: Allocations and Service Rules for the 71-76 GHz, 81-86 GHz, and 92-95 GHz Bands; Loea Communications Corporation Petition for Rulemaking, Report and Order, WT Docket No. 02-146, RM-10288

I am pleased to approve this item, which adopts service rules to facilitate commercial use of the 71-76 GHz, 81-86 GHz, and 92-95 GHz bands. As I have previously discussed, the amount of available spectrum is ultimately limited only by technology. *See generally* Separate Statement of Commissioner Kevin J. Martin, *Amendment of Part 2 of the Commission's Rules To Allocate Spectrum Below 3 GHz for Mobile and Fixed Services To Support the Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems*, Memorandum Opinion and Order and Further Notice of Proposed Rulemaking, 16 FCC Rcd 16043 (2001). Today's Order illustrates that point. The 71-76 GHz, 81-86 GHz, and 92-95 GHz bands – which have wavelengths of about three to five millimeters – have never before been used commercially. Indeed, it was previously unclear how these bands could be used. Now, however, the private sector is experimenting with different uses for these bands, and this spectrum may ultimately be used commercially for high-speed wireless local area networks, broadband access systems for the Internet, point-to-point communications, and point-to-multipoint communications. I am pleased that we are facilitating these kind of services.

While, at present, the Commission must regard spectrum as a scarce natural resource, I am optimistic that future technological development will reduce this sense of scarcity. Such development may, as here, enable use of previously unusable spectrum bands and provide for more efficient use of the spectrum we are already using. Today's Order increases my optimism.

**SEPARATE STATEMENT OF
COMMISSIONER JONATHAN S. ADELSTEIN**

Re: Allocation and Service Rules for the 71-76 GHz, 81-86 GHz and 92-95 GHz Bands; Loea Communications Corporation Petition for Rulemaking (Report and Order; WT Doc No. 02-146; RM-10288)

One of my goals as a policymaker is to maximize the services and information that flow over our airwaves. We already have seen the great success of WiFi, the rollout of broadband over satellite, and the continued deployment of high-speed connections over cellular and PCS spectrum and in the MDS/ITFS bands. Today, we continue to promote the development of wireless broadband by adopting service rules for wireless devices in the 71-76 GHz, 81-86 GHz and 92-95 GHz bands (70/80/90 GHz bands). Some of the services proposed for these bands include fiber-like first and last mile connections and wireless local area networks.

I am particularly pleased with our service rules for the 70/80/90 GHz bands because the licensing approach we adopt today truly serves the public interest. In Commission parlance, the item provides for a non-exclusive nationwide licensing approach with site-by-site coordination. In layman's terms, we are making it easy for our licensees to get access to spectrum for really fast connections – gigabit speeds. Of course, we do not yet know what the market will look like or what the equipment will cost, but we have made the FCC part of the equation as simple as possible.

While I continue to support auctions to resolve cases of mutual exclusivity for applicants seeking wide-area licenses (such as in the Advanced Wireless Services item we also adopt today), the public interest is not always served by adopting a licensing scheme that creates mutual exclusivity. We already have held auctions for spectrum similar to 70/80/90 GHz, only to see that spectrum lay relatively unused for years – that outcome does not serve the public interest.

We had an opportunity here to break that mold, and I am glad we did. In the context of spectrum management, I have said before that different spectrum bands require different approaches. It would be easier for all of us if we could do a “one size fits all” approach, but we cannot. Simply put, some bands, like 70/80/90 GHz, may be better suited for coordinated use; some bands (like the AWS bands) are not. Just as some bands will require unique interference criteria based on propagation characteristics, others may be subject to frequent coordination with NTIA.

But no matter what licensing approach we choose, we can, and have today, put in place a framework of rules and policies that will foster innovation in the 70/80/90 GHz bands more naturally. A framework that ensures interference issues are addressed, but allows technologies to flourish. A framework that encourages a market-based approach to spectrum management. A framework that gets spectrum and wireless broadband in the hands of people who will use it – no matter where they are, and no matter when they realize they might need the spectrum.